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Building Schemata for Tax Provision Learning Based On Cognitive Load Theory and Constructivism

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BUILDING SCHEMATA FOR TAX PROVISION LEARNING BASED ON COGNITIVE LOAD THEORY AND CONSTRUCTIVISM

BY

ELLEN EDWARDS BEST

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ACCEPTANCE

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ABSTRACT

BUILDING SCHEMATA FOR TAX PROVISION LEARNING BASED ON COGNITIVE LOAD THEORY AND CONSTRUCTIVISM

BY

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This study investigated whether different instructional methodologies have an impact on learning a complex accounting task: tax provision work. To become proficient in making tax provision judgments, an accountant must understand the rules and principles of GAAP and the rules and regulations governing income tax reporting. However, these two sets of rules are often in direct opposition. Using cognitive load theory and constructivist learning theory as a framework, this study predicted how schema acquisition, a key component of learning, could improve tax provision performance. Greater schema acquisition should in turn lead to more accurate performance. Hypotheses include the following: (a) participants who learn using a systems instructional method will perform better than participants who learn using traditional instructional method, (b) participants who practice actively should perform better than participants who practice passively, and (c) the relationship between instructional method and performance will be moderated by the practice method. These hypotheses were tested using a 2 x 2 between-subjects experiment, manipulating instructional method and practice method as independent variables. The results of this study are inconclusive. The statistically significant findings are invalid due to potentially unequal pre-tax knowledge among the subjects, and several hypotheses were not supported. The results of this study had the potential to benefit theory, practice, and education by identifying the most effective combination of instructional method and practice method to build a tax provision schema in a novice learner. However, due to design flaws, this study did not realize that potential.

I. INTRODUCTION

This study investigated whether a systems approach to learning and an active approach to practicing new skills might be combined to build a novice learner's tax provision schema, which should lead to better performance in tax provision judgments. This study was intended to inform both professional practice and classroom instruction by identifying effective and efficient ways to teach such a complex accounting topic.

Federal tax provision preparation is one of the more complex tasks required of tax accountants (Ernst & Young 2012; Graham et al. 2012). This complexity is deepened by the increasing amount of regulation and interpretation issued by the Financial Accounting Standards Board (FASB) related to tax provision work.[1] Yet large public accounting firms require that their tax staff be able to calculate and review clients' federal tax provisions more autonomously, as evidenced by a review of several of the "Big Four" accounting firms' proprietary federal tax provision training materials aimed at tax staff. To become proficient in tax provision judgments, an accountant must understand the rules and principles of GAAP and the rules and regulations governing income tax reporting (Mills and Plesko 2003). However, these two sets of rules usually have different treatments for the same accounting event (Hanlon and Heitzman 2012).

Prior to 2000, few accounting studies focused specifically on tax provision work, but in the past decade it has become one of the most active areas of tax research (Graham et al. 2012; Hanlon and Heitzman 2012). Most of these recent studies are archival in nature and tend to focus on tax provision use in earnings management. Many of these studies point to the complexity of the tax provision process in relation to other financial accounting concepts, and several studies have found that, in general, tax provisions are not well understood (Chen et al. 2003; Lev and

[1] The most recent version of this tax provision guidance is outlined under Accounting Standards Codification 740, *Income Taxes* (FASB 2009) and addresses how companies should account for and report the effects of income tax.

Nissim 2004; Thomas and Zhang 2011). From a public accounting perspective, tax provision error has been and remains a leading cause of restatements and Sarbanes-Oxley material weaknesses (Deloitte 2011; Ernst & Young 2012; PriceWaterhouseCoopers 2009). Additionally, Deloitte (2011) found that one of the lead causes of tax-related material weakness was due in part to poorly trained personnel. While evidence shows that the tax provision process is difficult and poorly understood, no research to date has focused on tax provision training, specifically how to improve the tax provision skills of novice accountants. My study was designed to shed light on the tax provision learning process in order to inform professional practice about alternate training approaches for such a complex task. Specifically, this study examined various combinations of instructional method and practice method that might lead to higher levels of tax provision performance in a novice accountant.

Two theories from educational psychology provided the framework for this investigation: cognitive load theory and constructivism. Cognitive load theory (CLT) suggests that minimizing cognitive load during instruction increases knowledge transfer, in turn leading to better performance on the task related to the instruction (Mostyn 2012). Constructivism suggests that engagement in active learning increases acquisition of conceptual knowledge and facilitates application in future scenarios, also leading to higher performance on the task related to the instruction (Kirschner et al. 2006). Both of these theories posit that building a novice's internal schemata is the best way to facilitate long-term learning (Kalyuga et al. 2001a; Kirschner et al. 2006).

Learning requires that the learner have working memory capacity during the learning process. The cognitive load placed on working memory is impacted both by the inherent nature of the material and by the way in which it is presented (Kirschner 2002). While prior tax

research has not addressed the tax provision learning process, other areas of accounting have used CLT, specifically systems-thinking, to understand learning in an accounting environment (e.g., Brewster 2011; O'Donell and Perkins 2011). According to CLT, using a systems-thinking approach could assist users in generating their own personal schemata that should, in turn, decrease the load that learning places on their cognitive function (Clark et al. 2006). Several accounting researchers have suggested that using a systems approach might help auditors develop more effective mental models for auditing tasks (Bell et al. 1997; Bell et al. 2002; Brewster 2011; O'Donnell and Perkins 2011; Peecher et al. 2007). The audit tasks investigated in these studies were all complex in nature (e.g. analytical procedures), requiring the participants to build their own mental models of the relationships among accounts in order to increase performance in the required tasks. The tax provision process is also complex, requiring the preparer to understand the relationships among accounts in order to properly prepare a provision. Based on previous literature in educational psychology (Paas et al. 2010), participants who learn using a systems form of instruction should perform better than participants who learn using a traditional form of instruction.[2]

Actively engaging in the learning process is necessary when following a constructivist approach to learning. Previous literature using a constructivist approach to learning (Stewart et al. 2012) suggests that participants performed better when exposed to an active learning process. Accordingly, participants who engage in active practice should demonstrate better tax provision performance than participants who engage in more passive practice.

To determine the main effects of CLT and constructivism, I investigated whether CLT and constructivism could be combined to achieve different levels of performance. If minimizing

[2] In this study, a traditional form of instruction is defined as information presented in a bulleted list rather than presented showing the overall system. The traditional form was the typical approach observed in a review of three "Big 4" public accounting firms' tax training materials.

cognitive load and applying constructivist principles both improve learning, regardless of the presence of the other, then the combination of instructional method and practice method should have an additive effect on learning. However, active practice requires a higher cognitive load than passive practice, particularly for a novice (Paas et al. 2003). CLT suggests that active practice could lead to lower performance due to the increased strain placed on cognitive load by the high number of items in working memory (Sweller 1988). In particular, active practice (also referred to as problem solving or discovery learning) places a great amount of cognitive strain on a novice learner.

Some active learning can be beneficial for a more experienced subject (Paas et al. 2003). If an active, constructivist approach to learning helps experienced learners, then participants trained using a systems approach should benefit more from active practice (Kirschner et al. 2006). Because this group is likely to have already started building an internal schema during instruction, cognitive load from active practice should not be as high as it would be for participants trained using the traditional instruction method.

Following this reasoning, the third hypothesis predicts that the relationship between instructional method and performance will be moderated by the type of practice (i.e., active or passive). If this prediction holds, then the prediction for a main effect of practice method on learning will not hold. Participants trained using the systems approach should benefit more from active practice than passive practice, but participants trained using the traditional method will benefit more from passive practice than active practice.

This study used a 2 x 2 between-subjects experiment to manipulate *instructional method* (systems /traditional) and *practice method* (active/passive). Information content was held constant across all conditions. The primary dependent variable was task *performance* in four

different tax provision scenarios. Additionally, this study measured *task efficiency* (performance weighted by time) to determine which of the instruction and practice method combinations led to the most efficient tax provision performance.

The results of this study did not support the predictions. A review of the descriptive statistics revealed that the subjects were not randomly distributed across experimental conditions, so even though one of the dependent variables did have a statistically significant result, this result might have been due to a disproportional number of subjects in one cell having prior tax knowledge. In addition, the task given to the subjects might have been too difficult for them to understand, even with the pre-task instruction. Also, power analysis indicates that the sample size was too low to obtain reliable results; the effect of both manipulations was fairly small, so more data is needed to achieve a sample size large enough to detect any significant effects. To meet this standard, the instrument needs to be redesigned to assure the task is appropriately challenging for the subjects.

The results of this study are inconclusive, but future research on tax provision learning, using a redesigned instrument, has the potential to help educators and firms that prepare novices for tax provision work. A recent review of training materials shows that many firms are using traditional methods to teach tax provision skills, possibly ignoring a potentially more effective form of training. Additionally, a review of several accounting textbooks (Fischer et al. 2012; Hoffman et al. 2011; Pope and Anderson 2012; Spiceland et al. 2013; Stice et al. 2010) shows that tax provision instructional material, when included in the text, is typically presented in a traditional format. If instructional method and practice method have significant effects on learning, educators and professional programs could potentially improve the effectiveness of tax provision training.

In addition to informing practice and education, redesigning this study could potentially inform theories that address complex problem solving. Most of the literature in educational psychology tends to favor either a CLT approach or a constructivist approach to learning (Kalyuga et al. 2001a). This study attempted to add to that literature by providing evidence that additional gains in performance on a complex task might be achieved by combining the two approaches into one instructional setup. This study also attempted to extend the current accounting literature on the benefits of systems-thinking in learning a complex accounting task. Brewster (2011) found that systems-thinking improves performance in analytical procedures, one of several audit tasks. While both tax provisions and analytical procedures can be classified as complex accounting tasks, the tax provision process involves building current and future tax expectations based on current and past transactions rather than comparing results to expectations to identify risk. If systems-thinking also improves performance on tax provision judgments, the systems approach might be an effective method for learning other complex accounting tasks. Finally, no studies to date have examined the process of tax provision learning in any format. While the results from this study were inconclusive, a redesigned study that looks at different instructional methods and practice methods could potentially identify a more effective instructional approach for novice tax accountants.

The remainder of this paper is organized as follows: Section 2 describes the background, theoretical framework, and hypotheses; Section 3 describes the experimental design; Section 4 presents the results of the study; and Section 5 concludes with a summary of the findings and implications.

II. BACKGROUND AND HYPOTHESES

2.1 Building Schemata in Tax Provision Novices

A schematic structure is one in which knowledge can be described as a hierarchy of components, with each component being connected to other components both spatially and temporally (Frederick 1991). Schema forms "chunked" elements in working memory (explained in Section 2.3.1) that, with repetition, can be transferred to long-term memory (LTM) (Chi et al. 1982). Learning is defined as the change in LTM schemata; adding a new schema to LTM is one of the steps in changing a novice into an expert (Mostyn 2012). Thus, a successful training program is one that enables novices to build their own tax provision schemata. As depicted in Figure 1, this study attempted to facilitate schema building by combining a systems approach to instruction and an active practice method to enhance performance on tax provision judgments.

Insert Figure 1 here

2.2 Background on Tax Provisions

The concept of a tax provision is outlined formally as Accounting for Income Taxes (AFIT) under Accounting Standards Codification (ASC) 740, *Income Taxes*, and addresses how companies should account for and report the effects of income tax.[3] The increase in tax provision guidance began in earnest with FAS 109 (FASB 1992) and has continued with FIN 48 (FASB 2006) and ASC 740 (FASB 2009). Tax provision preparation under ASC 740 is arguably one of the most difficult tasks a tax practitioner must complete (PriceWaterhouseCoopers 2009). To become proficient at tax provision preparation, an accountant must understand the rules and principles of GAAP and the rules and regulations governing income tax reporting. However, these two sets of rules are often in direct opposition (Graham et al. 2012; Shackelford et al.

[3] More specifically, AFIT is the process of creating the tax provision by both accounting for current income tax expense and analyzing current and past transactions to determine future cash tax payments and refunds (Graham et al. 2012).

2011). The individual completing the provision must be able to identify all potential book-to-tax differences, understand both the GAAP implications and the tax implications of those differences, and then correctly calculate both a deferred and current component of the total federal tax provision. Additionally, because provisions are covered under FASB and not the Internal Revenue Code (IRC), provision work is unlike most other types of tax compliance work (Deloitte 2011; PriceWaterhouseCoopers 2009).

In brief, ASC 740 outlines financial accounting and reporting standards for the effects of income taxes that could potentially result from an enterprise's activities during the current and preceding years. ASC 740 requires an asset and liability approach for financial accounting and income tax reporting. A review of the tax provision training materials provided by several large accounting firms shows a pattern of teaching tax provision preparation using multiple case studies.[4] These case studies list all of the accounts involved in the tax provision, but they typically do not give the trainees a map or diagram of the relationships among these accounts. In other words, these training programs typically emphasize learning the individual parts of the provision. Several recent accounting textbooks show a similar approach to teaching tax provision work (Hoffman et al. 2011; Pope and Anderson 2012; Spiceland et al. 2013). In the typical textbook, the rules for completing a tax provision are laid out in a checklist, each point is discussed, and then examples follow. Like the training materials provided by firms, these textbooks never give an overall picture of the tax provision process. I refer to this type of approach collectively as a traditional method of instruction.

[4] For example, most of these training materials start with a slide show lecture outlining the basics of the tax provision, without ever giving trainees an overall map. Then participants go through a realistic, complex case, usually over a one or two-day session. However, the main focus in all of these training materials is on the complex tax and GAAP rules, and none of the training materials reviewed ever summarize the entire tax provision process on a single page. Essentially, these training materials work through the components without ever showing participants the entire system. Additionally, these training materials are not available to the general public, and permission to review the material was given on the condition that it would not be made available outside of this study. The training materials reviewed came from three of the "Big 4" accounting firms located in Atlanta, Georgia.

According to CLT, particularly systems-thinking methodology, there are potentially better ways to teach such a complex topic. Teaching a novice accountant about tax provisions using a systems approach has the potential to improve effectiveness in the tax provision judgments by allowing the novice to see both the accounts involved in the provision and the relationships among those accounts instead of merely learning the necessary steps to complete a provision. A systems approach to instruction is best understood within the framework of CLT.

2.3 Cognitive Load Theory

CLT provides the backdrop for understanding individual information processing and learning (Paas et al. 2003) by examining the limitations of human working memory. CLT addresses the learning of complex cognitive tasks; in such tasks, learners are frequently overwhelmed by the amount of disparate elements that must be considered simultaneously before any meaningful learning can take place (Paas et al. 2010). For effective learning to occur, schemata must be transferred successfully from working memory to long-term memory so that the user can then access that new information at a later date.

2.3.1 Background on Cognitive Load and Working Memory

Working memory is necessary for the concurrent storage and use of information (Baddeley 1992) as well as the transfer of knowledge to long-term memory, where it can be accessed again in the future. Within this limited space in working memory, CLT helps to provide guidelines for effective schema construction. Working memory is accessed by an inexperienced learner when they begin to learn new material. In fact, all conscious activities take place in working memory, for it is the only part of memory that can be actively monitored by the learner (Kirschner 2002). The primary limitation of working memory is that it can only hold about three

to five items at any one time (Cowan 2001), and the processing of those items is limited to only two or three at a time (Miller 1956).

For learning to occur, the learner must have working memory capacity during the learning process. The load placed on working memory is impacted both by the inherent nature of the material and by the way in which it is presented (Kirschner 2002). To learn a complex task, a good schema must be constructed, for all of the information in the material to be learned is naturally highly interconnected. Because the intrinsic cognitive load of this material is high, the extraneous cognitive load imposed by the instructional format should be as small as possible (Mostyn 2012).

Due to the limited capacity of working memory, the more items that a learner tries to hold in working memory, the higher the cognitive load that learner will experience and the less likely she is to transfer that knowledge to LTM (Sweller 1988). In learning any task, there are actually three types of load involved. First, every task has some level of intrinsic cognitive load that is imposed by the content itself. Second, there is the extraneous cognitive load that is typically imposed by information that is irrelevant to the learning process. In many cases, extraneous load is the result of a poorly designed instructional instrument that impedes schema development. Finally, there is the germane cognitive load, which is the amount of resources working memory utilizes to develop and acquire schemata (Mostyn 2012). Germane cognitive load is desirable because, if used properly, it promotes schema development and acquisition. Germane cognitive load can be influenced by instructional design (Paas et al. 2004). Thus, to optimize cognitive load on working memory, a good instructional method would both minimize extraneous cognitive load and maximize germane cognitive load (Paas et al. 2003).

In contrast, LTM is used to house information that can then be accessed and used by working memory. More permanent knowledge and skills are stored in LTM (Kirschner 2002), and LTM can be understood as the central structure of all human cognition (Kirschner et al. 2006; Paas et al. 2010). Thus, in order to transfer knowledge and aid in a novice learner's internal schema development, learning must reach LTM (Mostyn 2012). An instructional method that meets these criteria should help a novice learner develop schemata in LTM similar to the way an experienced learner might develop schemata over time. In order to transfer information from working memory to LTM, that information must be encoded by the learner. To be properly encoded, the information must be meaningful to the learner, and in this context, "meaningful" is defined as the degree to which the information can be related to other information already present in LTM (Bonner 2007). LTM is subconscious in nature, so directly testing whether a schema has been successfully transferred to LTM is inherently difficult.

In the area of LTM and accounting knowledge acquisition, Bonner and Walker (1994) found that specific combinations of instruction and feedback led to gains in auditing knowledge. Ricchiute (1992) found that memory organization and the order of working paper evidence interacted to affect audit judgments. Other studies have shown that auditors' acquisition of knowledge related to analytical procedures can be improved through feedback or through increased cognitive effort (Earley 2001; Moreno et al. 2007). While these studies did not explicitly relate their hypotheses to CLT, the findings do support the general premise behind CLT. Humans only have so much working memory available, and when overloaded with information, learning and performance become less efficient and less effective. One study, Brewster (2011), did link gains in auditing knowledge to CLT through systems-thinking; this study is discussed in more detail in Section 2.3.2.

2.3.2 How Systems-Thinking Methodology Reduces Cognitive Load

In the context of CLT, systems-thinking helps users generate an understanding of a complex system by promoting a holistic perspective for analyzing problems and finding solutions (Checkland 1999; Doyle 1997). A complex topic presented as a system should increase the desirable germane load by presenting the information as a developed schema (Mostyn 2012). Systems-thinking has evolved into a paradigm for inquiry that shifts the focus from simply analyzing the parts of a problem to focusing on the whole picture (Laszlo 1996). Focusing on a complex task as a whole process rather than on the individual parts of the process helps a novice learner build a schema similar to a more experienced learner. A schema, or cluster of information (Clark et al. 2006), can be held in working memory as a single item (Kirschner 2002). Thus, cognitive load decreases because the number of items held in working memory is smaller.

Several studies in accounting and business have used systems-thinking to help users see the big picture in complex systems, to gain a better understanding of the relationships among individual causal processes, and to improve performance. O'Donnell and Perkins (2011) examined whether a systems-thinking tool helped auditors better assess risk; they found that the tool increased the auditors' pattern focus when performing analytical procedures. Cavaleri and Sterman (1997) found that managers at an insurance company who used systems-thinking tools developed new insight into the causal relationships that affected their business processes. Other studies have suggested that without systems-thinking, businesses routinely fail to recognize the nature and importance of interdependent processes (Jacobson 2001; Sterman 1989).

Brewster (2011) found that systems-thinking fostered the development of more coherently organized mental models, which improved auditor performance in analytical procedures. Brewster found that an increased use of causal schemata reduced working memory

constraints and improved process efficiency. Tax provisions, like analytical procedures, are complex accounting judgments that must take into account the interrelations among multiple accounts. Thus, a systems-thinking approach to tax provision learning might also lead to a reduction in working memory constraints and improved process efficiency.

Complex accounting topics are often taught in a linear fashion[5] (traditional lecture presentation), and many do not include any type of systems-thinking, especially in the area of taxation. Tax provisions rely heavily on the interactions among accounts to determine the final current and deferred tax amounts (Hanlon and Heitzman 2010). Tax provision training that decreases cognitive load should allow learners to focus better on these interactions, rather than each account individually, thus allowing a novice learner to begin building a tax provision schema similar to the schemata of more experienced learners. The presence of this schema should then lead to better judgments related to provision events. This reasoning leads to the first prediction:

H1: *A systems-thinking instructional method will lead to more accurate tax provision judgments than a traditional instructional method.*

2.4 Constructivist Learning

Constructivism is the second major theory used to guide learning within educational psychology. Constructivism emphasizes the importance of developing conceptual understanding of the material, in turn helping the learner develop an individual mental model (or schema) of the material (Kirschner et al. 2006). The overarching goal of a constructivist approach to learning is

[5] There are two major tax textbooks used in most individual and corporate tax classes: *South-Western Federal Taxation* (Hoffman et al. 2011) or the Prentice Hall's *Federal Taxation* (Pope and Anderson 2012). Both of these texts address tax provisions, but they both present the information using what this study refers to as the "traditional" method of instruction. No figures are provided to show the interrelation among tax provision accounts. Additionally, many intermediate and advanced accounting textbooks, if they mention tax provisions at all, present the tax provision material in a "traditional" form (Fischer et al. 2012; Spiceland et al. 2013; Stice et al, 2010).

to aid the learner in constructing his or her individual schema of the information to be learned, rather than simply providing that information to the learner (Handelsman et al. 2004; Renkl and Atkinson 2007). Thus, allowing a novice learner to participate actively in the learning process should lead to more accurate tax provision judgments, provided correct schema formation occurs. The conditions under which constructivist learning has been effective in past research help explain why this active practice method should aid in schema acquisition.

2.4.1 Background on Constructivist Learning

Bruner (1961) first formally laid out the concept of discovery learning (i.e., actively discovering the answer rather than being shown the answer), and over the years, this concept has spurred many related educational theories that can all be understood as slightly different forms of the constructivist approach. Constructivism focuses on the end goal of knowledge acquisition, rather than on the mechanisms that must be triggered for knowledge acquisition to occur (Mostyn 2012). A minimal amount of guidance might be necessary initially, but the main focus is to encourage learners to take an active part in the learning process, thus increasing their ability to acquire and apply conceptual knowledge (Kirschner et al. 2006).

Constructivism has been prevalent in accounting education for several decades. The Accounting Education Change Commission, which was created in 1989, has advocated several constructivist approaches, such as "learning to learn," case studies, and small group activities (Mostyn 2012). Even with the use of constructivist principles in accounting education, they have not played a significant role in accounting research. Of the accounting studies that do incorporate constructivism, most have focused on cooperative learning and have shown mixed support for building schema and promoting long-term learning (Gabbin and Wood 2008; Hwang et al. 2008). However, several studies in educational psychology have suggested that certain learning

scenarios and learners might benefit from a constructivist approach to learning (Handelsman et al. 2004; Kalyuga et al. 2001b)

2.4.2 Constructivist Learning and Complex Tasks

Constructivist theory states that learning occurs most effectively when learners develop their own mental models. Cognitive load is not taken into account; rather, the theory emphasizes that learners must actively participate in the learning process (Kalyuga et al. 2001a). This approach should allow learners to integrate new information into their existing knowledge structure, facilitating "deep learning." A common way to promote "deep learning" is to have participants engage in self-directed inquiry and personal reflection to develop content strategies (Hmelo-Silver et al. 2008). Scaffolding, or building up to the right answer piece by piece, promotes "deep learning" by giving guidance just beyond what the learner is capable of understanding (Kalyuga et al. 2001a). As the learner integrates this new piece of information, then another piece of the puzzle is presented. Previous research in education has found that this approach leads to an improvement in learning beyond what is observed from typical worked-out examples (Atkinson et al. 2000). Thus, a learner who is allowed to take an active role in the learning process should better encode the information being learned than a learner passively viewing completed examples. This active participation should, in turn, lead to better performance on subsequent tasks related to the information learned. This reasoning leads to the second prediction:

H2: *An active practice method will lead to more accurate tax provision judgments than a passive practice method.*

2.5 Combining CLT and Constructivism to Build Schemata

The debate in psychology between supporters of CLT and supporters of constructivism has lasted over fifty years (Kirschner et al. 2006). Constructivism is intuitively appealing to many and has been implemented in many "progressive" corporate training environments and accounting educational environments (Mostyn 2012). CLT supporters do not believe there is any "real" empirical data to back up the claims of constructivism, but those findings have in turn been refuted by constructivist supporters (Kalyuga et al. 2001a; Mostyn 2012 Paas et al. 1993; Sweller 1988). Thus, the research shows no real consensus on which method of learning leads to greater gains in knowledge. Curiously, only a minimal amount of research has tried to reap the benefits of both theories, most likely because at first glance, the theories seem diametrically opposed.

While CLT and constructivism do at first appear to be mutually exclusive, some previous literature in education has indicated that these two theories can be combined to increase learning in certain scenarios (Stewart et al. 2012). Both CLT and constructivism claim to lead to the largest gains in knowledge transfer, so if these two approaches were integrated, the two learning methodologies could have an additive effect on learning. If a systems-thinking instructional method led to more accurate tax provision judgments, then the learner would no longer be a true novice but a novice with a newly formed tax provision schema. This potential additive effect suggests that an instructional instrument that incorporated the best practices of both theories could lead to the highest level of performance. If a constructivist approach to learning were more beneficial to a learner with a schema, then the highest level of learning would occur when combining an instructional method that followed CLT with a constructivist practice method. Likewise, the lowest level of learning would most likely occur when combining an instructional

method that did not follow CLT with a constructivist practice method. This second combination would theoretically place the greatest amount of cognitive strain on the learner in both the instructional and practice areas. Some research in educational psychology has hinted at combining these CLT and constructivism, particularly in the study of active and passive learning. However, only one study to date has tested the effects of this combination. Kalyuga et al. (2001b) found that, following instruction, novice learners became more experienced and benefitted more from active problem-solving than from a passive worked-example approach.[6]

Various educational psychology studies have found that problem-solving primarily benefits experienced learners and that problem solving tends to confuse novice learners (Kalyuga et al. 2001a; Kirschner et al. 2006; Sweller 1988). Lacking even a partial schema imposes a heavy cognitive load on the novice learner when she is presented with an active problem-solving scenario (Sweller 1988). Thus, if an instructional method has been successful in transferring a schema into a novice learner's LTM, then the learner should resemble a more experienced learner and should benefit more from active practice. Given that a systems method is more effective at transferring a tax provision schema, the practice method should moderate the relationship between instructional method and performance. This reasoning leads to the following predicted interaction:

H3: *The systems-thinking instructional method combined with an active practice method will result in the most accurate tax provision performance, and the traditional instruction method combined with an active practice method will result in the least accurate tax provision performance.*

[6] In that study, instruction was manipulated within subjects as absent or present; thus, it does not exactly test the manipulations used in the current study.

2.6 Effectiveness and Efficiency in Tax Provision Performance

Accounting training, at its best, should promote both efficiency and effectiveness in the learning process. Brewster (2011) found that learners in his systems condition took more time to complete the audit task, but there were informational differences between his experimental conditions. Given that the current study controlled for information content, the learners were expected to spend the same amount of time using each instructional method. Due to the operationalization of the active and passive practice methods, learners in the active condition were expected to spend more time on practice than learners in the passive condition. However, the current study could not predict the instruction-practice combination that would lead to the most efficient performance on the provision task. This raises the following research question:

RQ: *Which combination of instructional method and practice method will lead to the highest level of task efficiency (performance weighted by time on task)?*

III. METHOD

3.1 Experimental Design and Task Description

This study used a 2 x 2 between-subjects design, manipulating *instructional method* (systems vs. traditional) and *practice method* (active vs. passive) as the independent variables. The dependent variable was task performance on four different provision scenarios. Each scenario listed three tax provision accounts: current tax liability, deferred tax assets, and deferred tax liability. *Performance* was measured as correct judgment for each of those accounts. Thus, the performance score ranged from 0 (no account judgment correct) to 3 (all account judgments

correct) for each separate tax provision scenario. Each provision scenario was more difficult than the previous scenario.[7]

To control for prior tax provision knowledge, three of the provision scenarios were also used in the pre-test administered at the start of the experiment. These pre-test scenarios were worded the exact same way as the scenarios used for the dependent variables, and each pre-test scenario matched its corresponding dependent variable scenario.

The research question examines the effect of *instruction method* and *practice method* on *task efficiency*. This study defined "task efficiency" as performance scaled by minutes spent on the task. A high score for task efficiency would indicate that the judgments were both correct and quickly made.[8]

3.2 Experimental Procedures

Participants worked through an online training module concerning the basics of a tax provision (see Appendix A and Appendix B for selected screen shots of the instrument). As shown in Figure 2, the participants progressed through six stages during the experiment. Stage one introduced the experiment and included a pre-test to ascertain each individual's initial tax provision knowledge. The pre-test consisted of three scenarios, and the participants were asked to determine the impact that each scenario had on current tax liability, deferred tax assets, and deferred tax liability. For each item, they had to report whether they thought the scenario would cause that item to decrease, increase, or stay the same. After each scenario, they self-reported their level of mental effort and confidence in arriving at their conclusions. The second round

[7] These scenarios were developed by consulting two different practicing tax managers, one in public accounting and one in industry. These managers helped develop common tax provision scenarios that a first-year tax associate would most likely encounter. These scenarios also resemble provision scenarios set forth in the two major tax textbooks reviewed in this study (Hoffman et al. 2011; Pope and Anderson 2012).

[8] If a participant took only 10 seconds (0.167 minutes) to complete the task and judged all three accounts correctly, the *task efficiency* score would be calculated as 3/0.1667 = 17.9964. If a participant took 45 seconds (0.75 minutes) to complete the task and they judged all three accounts correctly, the *task efficiency* score would be calculated as 3/0.75 = 4.

contained the manipulation of the first independent variable, *instructional method*, and participants were walked through the basics of a tax provision.

Insert Figure 2 here

After the instructional round, participants entered a practice phase where they were given three tax provision scenarios to work through. This round contained the manipulation of the second independent variable, *practice method*. Regardless of the condition, all of these practice scenarios dealt with different trial balance accounts than those given in the pre-test, but each practice scenario was similar in difficulty and scope to the pre-test scenarios.

Upon completion of the practice phase, participants entered into the distraction phase to clear their short-term memory. Clearing short-term memory is necessary to ascertain whether knowledge has actually been transferred to LTM. In an experimental setting, an efficient way to clear short-term memory is to have participants focus on a different topic (Bonner 2007). Because participants can only hold a small amount of information in their short-term memory, focusing on other non-related tasks has the same effect as the passage of time (Bonner 2007). If tax provision knowledge has been effectively transferred to LTM, participants should be able to access that information again during the final testing phase. Successful transfer cannot be directly tested, but performance during the final testing phase served as a proxy for effective LTM transfer (Paas et al. 2003).

Participants were told that the purpose of this distraction round was to collect general information about the participants and to measure each individual's general problem-solving capability. They answered a series of demographic questions, followed by three logic-based GRE questions. In addition to clearing short-term memory, the GRE questions also measured the

participants' logic-based problem-solving ability. Once they had answered all of the GRE questions (and viewed the solutions), they progressed into the testing phase of the experiment.

In the final testing phase, participants were given the exact same three scenarios they had seen in the pre-test, followed by a fourth scenario to which they had not been exposed in either the pre-test or the practice round. After working through each scenario, participants reported how much mental effort they had put forth in arriving at their judgments, as well as their confidence in the solution they offered. Once all four scenarios were complete, participants were all given feedback about their performance in the experiment. They were shown their answers on each pre-test scenario, each final test scenario, the correct solution for each scenario, and then a brief explanation of that solution.

Participants ended the experiment with three post-experimental questions related to overall mental effort, overall difficulty, and overall enjoyment of the experiment. Finally, participants answered two manipulation check questions related to the two manipulated variables.

3.3 Instructional Method

Instructional method was manipulated between subjects at two levels, *systems* (a flowchart) and *traditional* (a bulleted list), as shown in Figure 3, Figure 4, and Appendix A. The two conditions, flowchart and bulleted list, each contained the same introduction screens, informational content, and number of pages; the only difference between them was the presentation of the tax provision process. Participants in the systems condition were presented with the tax provision calculation process in a flowchart format. Participants in the traditional condition were presented with the tax provision calculation process in a bulleted list of steps. Figures 3 and 4 present the screen shots for the two instructional methods.

Insert Figure 3 here

Insert Figure 4 here

3.4 Practice Approach

Practice method was manipulated between subjects at two levels, *active* (interactive) or *passive* (solved example), as shown in Appendix A. In the interactive condition, participants were presented with three separate tax provision scenarios (one at a time) and asked to indicate the impact the scenario would have on current tax liability, deferred tax assets, and deferred tax liability. They were given three attempts to judge the scenario correctly. As soon as they got the scenario correct, they were presented with an explanation for the correct answer. If they failed to find the correct answer after three attempts, they were then shown the correct answer and the explanation for that answer. After finishing each practice scenario, they reported how hard they had thought about the scenario. In the solved example condition, participants were presented with the same three tax provision scenarios (one at a time) and were asked to think about how they would solve them. Once they had thought about their answer, they were instructed to click forward to see the solution and an explanation of that solution. They then reported how hard they had thought about the scenario.

3.5 Participants

Sixty senior undergraduate students from two advanced federal taxation[9] elective courses at a large university in the southeastern United States participated in the study. Table 1 reports the descriptive statistics for the participants both in aggregate and separated by condition. The

[9] At this particular university, the course Advanced Federal Taxation was an elective. These students had self-selected into a course related to the topic of this study and, thus, were likely to have a higher level of interest and a higher level of tax knowledge than the average accounting student. Similarly, accountants doing provision work for the first time have most likely selected a tax-related career path and are likely to have a greater level of tax knowledge and interest. If these students benefitted from the learning methods in this study, a similar first-year tax associate would also be likely to benefit from the same methods.

participants' average age was 28.4 years, 47% of the participants were female, and average self-reported GPA was 3.25 on a 4-point scale. Additionally, while some of the participants had completed accounting internships, only a few reported any corporate tax or provision experience. Overall, participants' average time to complete the experiment was 24.5 minutes. There were no significant age, gender, GPA, internship, corporate tax experience, tax provision experience, or completion time differences across conditions (all p-values: >.10, *two-tailed*). Additionally, none of these variables were significantly correlated with the dependent variables, nor did they have any statistical significance when entered into the hypotheses tests as control variables. Thus, none of the demographic variables were included as covariates when testing the hypotheses.

Insert Table 1 here

IV. RESULTS

4.1 Manipulation Checks

Two manipulation check questions were included at the end of the study to ascertain whether participants perceived which type of instructional method and practice method they participated in. The first question asked in which format the tax provision instruction had been presented: a flowchart format or a bulleted list format; 93% of the participants (56 out of 60) answered this question correctly. The second question asked whether, in the practice phase, they were asked to think about the practice problems and view the solution or were asked to actively solve each practice problem up to three times; 95% of the participants (57 out of 60) answered

this question correctly. These findings suggest that most of the participants were paying attention to the type of instruction and practice they experienced.[10]

4.2 Measures and Descriptive Statistics

Participants worked through three provision scenarios in the pre-test and four provision scenarios (the same three scenarios plus one additional scenario) in the testing phase. In each scenario, participants were required to indicate how the scenario would impact three tax provision accounts. Thus, performance scores in each scenario range from 0 (no accounts correct) to 3 (all accounts correct). Table 2 reports the descriptive statistics for the pre-test scenarios. While all three pre-test scenarios were answered correctly by at least one participant, no individual participant answered all three scenarios correctly. An analysis of the pre-test results indicates that in pre-test scenario one, the participants in the systems/active condition had significantly higher performance than participants in the other three conditions. This nonequivalence among cells means indicates that the results, particularly for scenario one, should be interpreted with caution.[11] Pre-test performance in the other two scenarios had no significant differences across conditions.

Insert Table 2 here

While not used directly in the hypothesis testing, Table 3 reports the change in performance across the first three provision scenarios. These results show that, overall, participants appeared to improve in scenarios one and three, but there was a very slight negative change in performance in scenario two. The negative change in performance for scenario two,

[10] Furthermore, dropping these participants from the hypothesis analysis did not qualitatively change the reported results in this study. Thus, all results were reported with all 60 participants included.

[11] The issues with interpretation as well as the best solution for nonequivalent sample means are discussed in the conclusion of the study. The significant difference in the pre-test for scenario one created an error in the Sum of Squares for the ANCOVA for scenario one. Thus, while the result was significant for H1 in scenario one, drawing a strong conclusion without gathering additional data and ensuring equivalency of sample cells would be problematic.

along with other issues, is addressed in the conclusion. There were no significant differences in performance in any of the three scenarios, but change in performance was not an adequate measure to test the hypotheses in any case, for it combined baseline knowledge and the outcome of the manipulations into one variable. Instead, for the first three scenarios, ANCOVA with the corresponding pre-test score on each scenario was used as a covariate to adjust for subject differences at the beginning of the study.

Insert Table 3 here

4.3 Test of Hypotheses

Performance scores in scenario one and scenario four are depicted in Figure 5; Panels A and D appear to be directionally consistent with the predictions made in all three hypotheses. In contrast, the results depicted for the other two dependent variables, the performance scores in scenario two and scenario three, do not appear to support the predictions made in the hypotheses.[12] The sections for each scenario below fully explore these results and their statistical significance.

Insert Figure 5 here

4.3.1 Scenario One Results

Scenario one asked participants to indicate the impact that meals and entertainment would have on the three provision accounts. H1 predicted a main effect of instructional method on performance. Consistent with H1, the comparison (not tabulated) of the means reported in Table 4, Panel A shows that participants given the systems instructional method had higher tax provision performance in scenario one than participants given a traditional instructional method ($t(58) = -3.26$; $p<0.01$, *two-tailed*). H2 predicted a main effect of practice method on performance. If H2 were supported, then participants using the active practice method would

[12] Several alternative explanations for these results are presented in the conclusion section of this study.

have higher tax provision performance than participants using the passive practice method. The comparison (not tabulated) of the means in the active condition versus the passive condition shown in Table 4, Panel A, does not lend statistically significant support to H2 ($t(58) = -0.56$; $p=0.575$, *two-tailed*). These comparisons for both H1 and H2 only tested the means across the two conditions and did not account for the participants' prior tax knowledge.

Insert Table 4 here

To account for the participants' prior tax knowledge, ANCOVA was used to test the predictions. The results of the ANCOVA, reported in Table 4, Panel B, appear to support H1. These results show that the effect of instructional method on performance was statistically significant ($F=7.85$; $p<0.01$, *two-tailed*), However, these results do not fully support H1 due to non-equivalent means in the pre-test scenario one results that were used as a covariate in this analysis. Thus, support for H1 from scenario one is inconclusive.

The results of the ANCOVA reported in Table 4, Panel B do not support H2 or H3. These results show that the effect of practice method on performance was not statistically significant ($F=0.00$; $p=0.958$, *two-tailed*), and there was not a significant interaction between instructional method and practice method ($F=0.24$; $p=0.630$, *two-tailed*).

4.3.2 Scenario Two Results

Scenario two asked participants to indicate the impact that a book-to-tax adjustment for bad debts would have on the three provision accounts. This question was clearly too hard for most of the study participants, and no hypotheses were supported in this scenario. H1 predicted a main effect of instructional method on performance. The comparison (not tabulated) of the means reported in Table 5, Panel A shows that the means were not significantly different ($t(58) = -0.14$; $p=0.886$, *two-tailed*). H2 predicted a main effect of practice method on performance. If H2

were supported, then participants using the active practice method would have higher tax provision performance than participants using the passive practice method. The comparison (not tabulated) of the means in the active condition versus the passive condition shown in Table 5, Panel A does not lend support to H2 (t(58) = 0.813; p=0.419, *two-tailed*). These comparisons for both H1 and H2 only tested the means across the two conditions and did not account for the participants' prior tax knowledge.

Insert Table 5 here

To account for the participants' prior tax knowledge, an ANCOVA was used to test the predictions. The results of the ANCOVA reported in Table 5, Panel B do not support H1 (F=0.03; p=0.873, *two-tailed*), H2 (F=0.50; p=0.481, *two-tailed*), or H3 (F=1.91; p=0.173, *two-tailed*). Additionally, even the results of the pre-test covariate were not significant (F=3.08; p=0.085, *two-tailed*). These findings suggest that the participants really did not understand the scenario to begin with and that they were no better off after receiving the instruction and going through the practice.

4.3.3 Scenario Three Results

Scenario three asked participants to indicate the impact a book-to-tax adjustment for first-year depreciation would have on the three provision accounts. While some participants did answer this scenario correctly, no hypotheses were supported by the results. H1 predicted a main effect of instructional method on performance. The comparison (not tabulated) of the means reported in Table 6, Panel A shows that the means were not significantly different (t(58) = 0.68; p=0.502, *two-tailed*). H2 predicted a main effect of practice method on performance. If H2 were supported, then participants using the active practice method would have higher tax provision performance than participants using the passive practice method. The comparison (not tabulated)

of the means in the active condition versus the passive condition shown in Table 6, Panel A does not lend support to H2 (t(58) = 1.08; p=0.284, *two-tailed*). These comparisons for both H1 and H2 only tested the means across the two conditions and did not account for the participants' prior tax knowledge.

Insert Table 6 here

To account for the participants' prior tax knowledge, an ANCOVA was used to test the predictions. The results of the ANCOVA reported in Table 6, Panel B do not support H1 (F=0.33; p=0.571, *two-tailed*), H2 (F=2.76; p=0.102, *two-tailed*), or H3 (F=0.22; p=0.644, *two-tailed*). The results of the pre-test covariate were significant (F=8.07; p<.01, *two-tailed*). These findings suggest that participants' performance on the task closely resembled their performance on the related pre-test; that is, participants did not achieve any gains in performance after receiving the instruction and going through the practice.

4.3.4 Scenario Four Results

Scenario four asked participants to indicate the impact a book-to-tax adjustment for third-year depreciation would have on the three provision accounts. While some participants did answer this scenario correctly, no hypotheses were supported by the results. H1 predicted a main effect of instructional method on performance. The comparison (not tabulated) of the means reported in Table 7, Panel A shows that the means were not significantly different (t(58) = -1.55; p=0.127 *two-tailed*). H2 predicted a main effect of practice method on performance. If H2 were supported, then participants using the active practice method would have higher tax provision performance than participants using the passive practice method. The comparison (not tabulated) of the means in the active condition versus the passive condition shown in Table 7, Panel A, does not lend support to H2 (t(58) = -0.67; p=0.500, *two-tailed*). These comparisons for both H1 and

H2 only tested the means across the two conditions and did not investigate the interaction of the conditions.

Insert Table 7 here

Scenario four was created to give participants a scenario they had not previously seen. Therefore, no covariate for prior tax knowledge was used in this analysis. To look for both main effects and the interaction, an ANOVA was used to test the predictions. The results of the ANOVA reported in Table 7, Panel B do not support H1 (F=2.36; p=0.130, *two-tailed*), H2 (F=0.54; p=0.466, *two-tailed*), or H3 (F=0.43; p=0.513, *two-tailed*). These findings suggest that participants' performance in the final scenario was not significantly different across conditions.

4.3.5 Results of all Scenarios

Overall, no conclusive significant results in this study supported the hypotheses. The only statistically significant result supported H1 in scenario one, but this result is inconclusive due to non-equivalent cell means in the pre-test covariate. In order to overcome the power issues, the non-equivalence in pre-test scenario one, and the difficulty participants had with several of the scenarios, the experiment needs to be redesigned and rerun.

4.4 Supplemental Analysis – Research Question on Task Efficiency

The research question asked which combination of instructional method and practice method would produce the highest levels of task efficiency, which is defined as performance scaled by time spent on the task. As depicted in Figure 6, task efficiency appeared highest in the systems/active condition in scenarios one and four. In scenario two, task efficiency appeared high in both the systems/active and the traditional/passive conditions. In scenario three, task efficiency appeared highest in the traditional/passive condition.

Insert Figure 6 here

The comparison (not tabulated) of the means for scenario one reported in Table 8, Panel A shows that participants given the systems instructional method had higher task efficiency in scenario one than participants given the traditional instructional method ($t(58) = -2.18$; $p<0.05$, *two-tailed*). The comparison (not tabulated) of the means for scenario one in the active condition versus the passive condition shown in Table 8, Panel A suggests that participants using the active practice method had higher task efficiency in scenario one than participants using the passive practice method ($t(58) = -2.30$; $p<0.05$, *two-tailed*). These comparisons for both instructional method and practice method only tested the means across the two conditions and did not investigate the interaction of the conditions.

Insert Table 8 here

To observe the effect of instructional method and practice method on task efficiency, additional ANCOVAs were run for task efficiency in scenarios one through three, and an additional ANOVA was run for task efficiency in scenario four. Only the ANCOVA for task efficiency in scenario one was significant, so those results are the only ones tabulated for this section. The results of the ANCOVA for task efficiency reported in Table 8, Panel B show a significant effect for instructional method ($F = 4.41$, $p<0.05$, *two-tailed*). While the descriptive statistics for task efficiency reported in Table 8, Panel A suggest that the there was a main effect of practice method, the results of the ANCOVA in Table 8, Panel B show no significant effect ($F = 3.25$, $p=0.08$, *two-tailed*). There was not a significant interaction between instructional method and practice approach ($F=0.22$; $p=0.641$, *two-tailed*). As expected, the covariate of pre-test performance was a significant indicator of task efficiency in scenario one ($F = 5.23$, $p<0.05$, *two-tailed*). Again, these results for scenario one should be interpreted with caution due to the non-

equivalent cell means in pre-test scenario one. Thus, the results for the research question are also inconclusive.

V. CONCLUSION

This study did not provide evidence that instructional method and practice method affect performance across different tax provision scenarios. Due to low power, non-equivalent cell means in pre-test scenario one, and design issues related to the difficulty of the tax scenarios, no generalizations about the impact of instructional method and practice method on tax provision performance are possible. Findings from prior research suggest that these two approaches could be combined to improve performance, but the findings in this study are inconclusive.

One reason the results of this study are not statistically significant might be the design of the tax provision scenarios combined with the type of participants used. The senior-level undergraduate accounting students might not have had enough domain-specific knowledge to complete the more difficult tax provision questions in this study, even given the schema for the tax provision relationships. While the instrument developed for this study does offer tax provision instruction, the participants were assumed to have at least some financial and tax accounting knowledge. Scenario one related to meals and entertainment, scenario two related to bad debt expense, and scenarios three and four related to depreciation expense. Senior-level students might have felt somewhat comfortable with meals and entertainment and depreciation but less comfortable with the rules regarding bad debt. The purpose of this study was to demonstrate the relationship among provision accounts, not to focus on specific book/tax rules. Indeed, scenario two might have covered rules with which these particular participants were not familiar.

The provision scenarios were created by consulting with two practicing tax mangers and two major tax textbooks, but the level of difficulty indicated by these managers and texts might not reflect the level of difficulty an accounting student would experience while completing a provision scenario. To remedy this situation, the tax scenarios themselves need to be piloted so that the participants can offer feedback about the difficulty of the provision scenarios. This approach would help establish a more valid range of difficulty from the first to last scenario.

A second reason for the inconclusive results might be the effect size of the manipulations themselves. Only sixty subjects in the target area of tax knowledge were available at the time of the study. If the effect sizes of the manipulations were too small, then the manipulation effects in the subject pool would be undetectable, apart from the other design problems. To correct this power issue in the future, the number of participants needs to be expanded, perhaps by waiting a semester and collecting data from a second group of students, who should at that point have the targeted amount of tax knowledge. As a result, the data collection phase might take a year or more to complete.

The third main issue with this study concerns the non-equivalent cell means in the first pre-test scenario. When data were collected for this study, participants were randomly assigned to the various conditions before completing the pre-test. This approach made non-equivalent cell means possible, and because this non-equivalence occurred, the only statistically significant result in this study is unreliable. To rectify this problem next time, participants should answer the pre-test scenarios and *then* be sorted into the different conditions. By evenly distributing the participants between conditions based on prior tax knowledge, non-equivalent cell means in the pre-test covariate should no longer be an issue.

If the issues discussed above are successfully addressed, subsequent studies could be of interest to both educators and firms that train novices in tax provision work. Given that both accounting firms and accounting textbooks seem to follow a traditional approach to provision training (Hoffman et al. 2011; Pope and Anderson 2012; Spiceland et al. 2013), considering a systems approach might reveal a more effective form of instruction. While there are multiple studies that relate to tax provisions in general (e.g., Amir et al. 2001; Guenther and Sansig 2000; Guenther and Sansig 2004; Phillips et al. 2003; Poterba et al. 2007), none have addressed the fact that such a complex task might be in the hands of relatively inexperienced accountants (Deloitte 2011). While the current study does not address the implications of this incongruity (a potential topic for future study), it does contribute to the literature by illustrating a new approach that firms could use to potentially increase the effectiveness of their provision training programs.

A limitation of this study is that it only used student subjects in a very simplistic, controlled environment. First-year tax staff might resemble the subjects of this study, but only if they were hired with an undergraduate degree. First-year tax staff with a graduate degree would have taken many more accounting and tax classes; thus, the results of this study might not apply to those individuals.

The results of this kind of study, after correcting the issues outlined above and collecting more data, could add to the discussion in educational psychology on the merits of CLT and constructivism in instructional design. Given evidence that performance gains on a complex task might be achieved by combining the two approaches into one instructional setup, educators and professional training programs could start developing more effective schema acquisition methods to improve novice learning. Revising this study would also extend the current accounting literature on systems-thinking in learning complex accounting tasks.

Finally, no studies to date have examined the tax provision learning process in any format. By looking at different instructional and practice methods, this study highlights the importance of approach when teaching a novice how to perform tax provisions.

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Figure 1
Theoretical Path

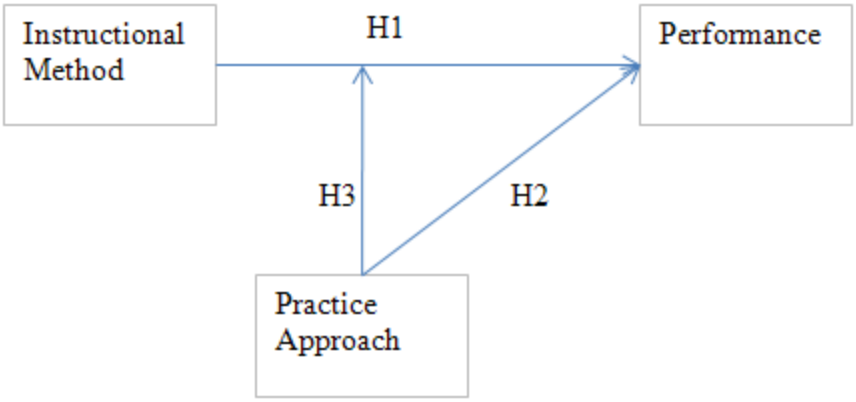


Figure 2

Experiment Time Line

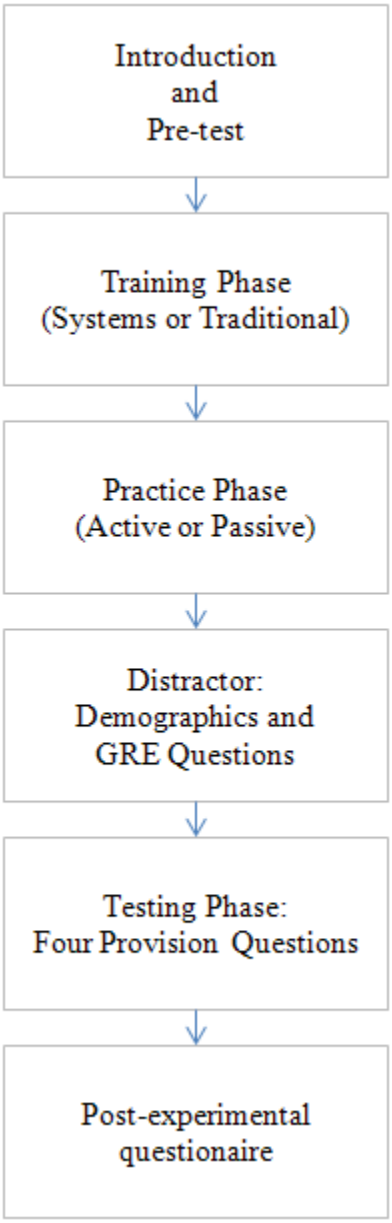


Figure 3

Systems Instructional Method Screenshot

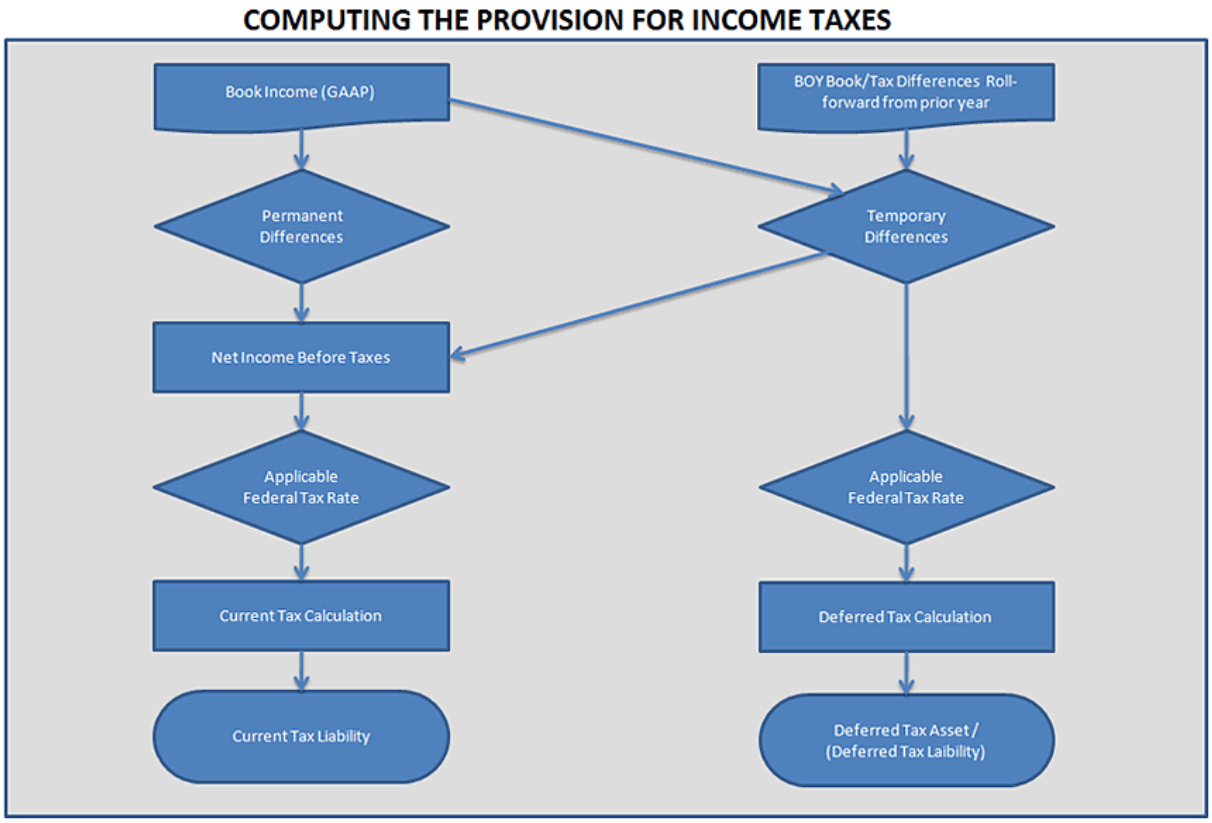


Figure 4

Traditional Instructional Method Screenshot

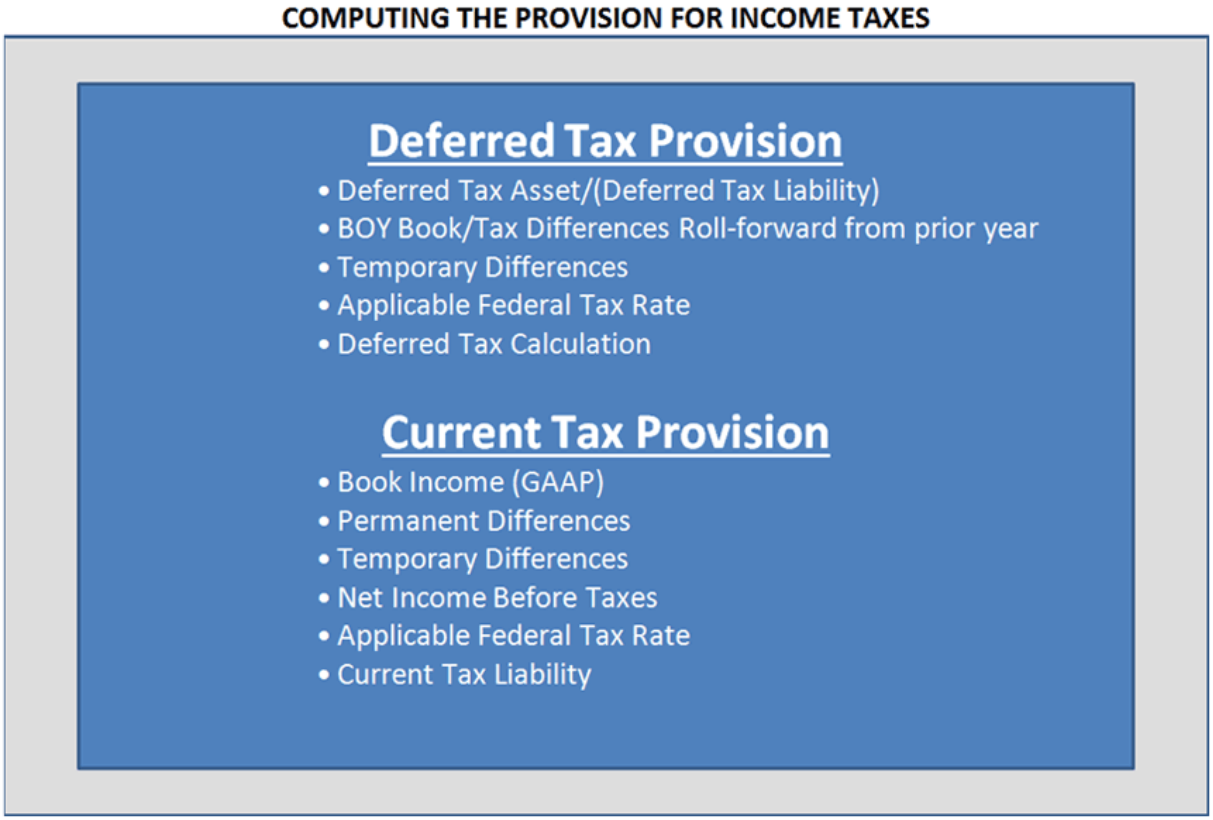
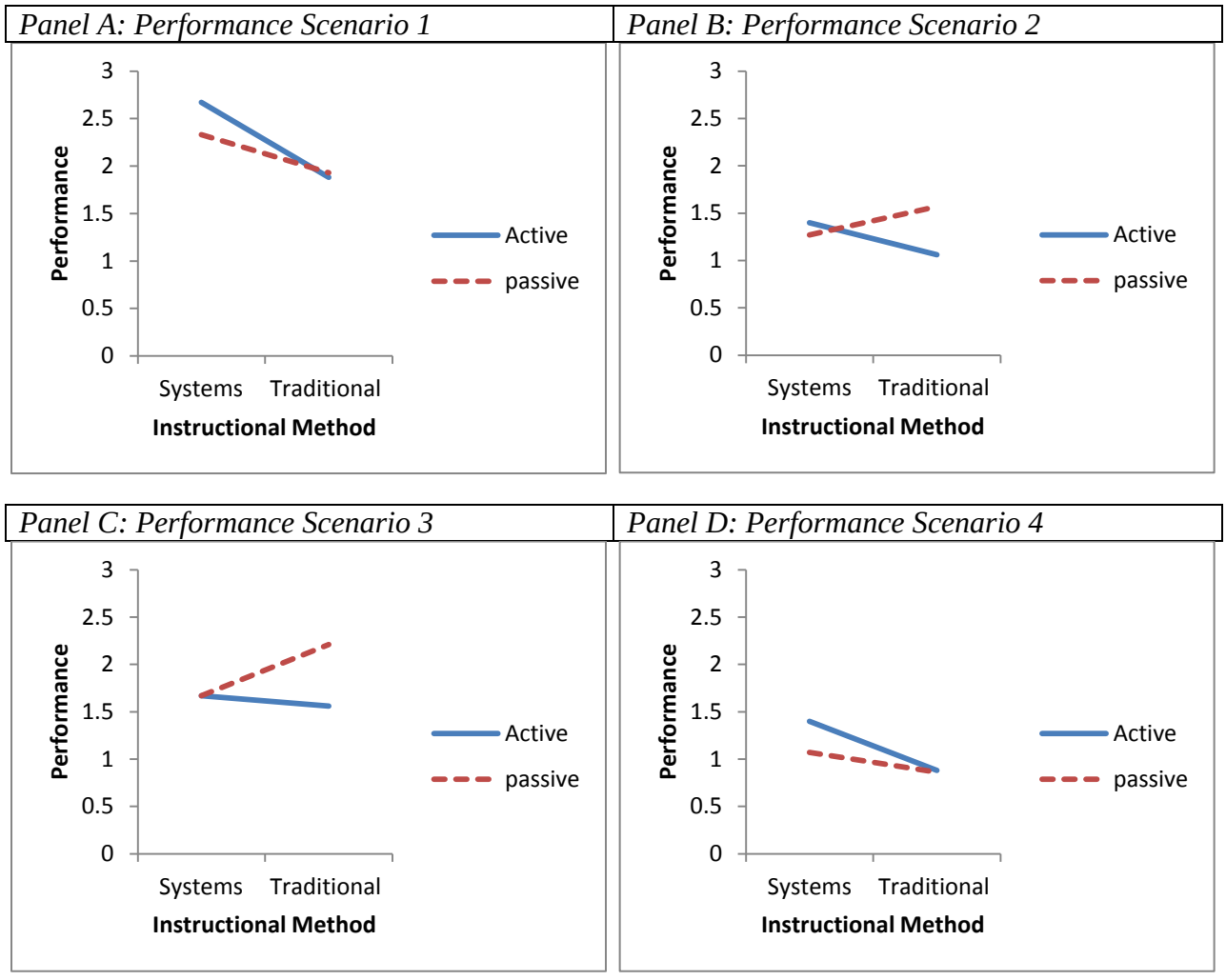


Figure 5
Performance



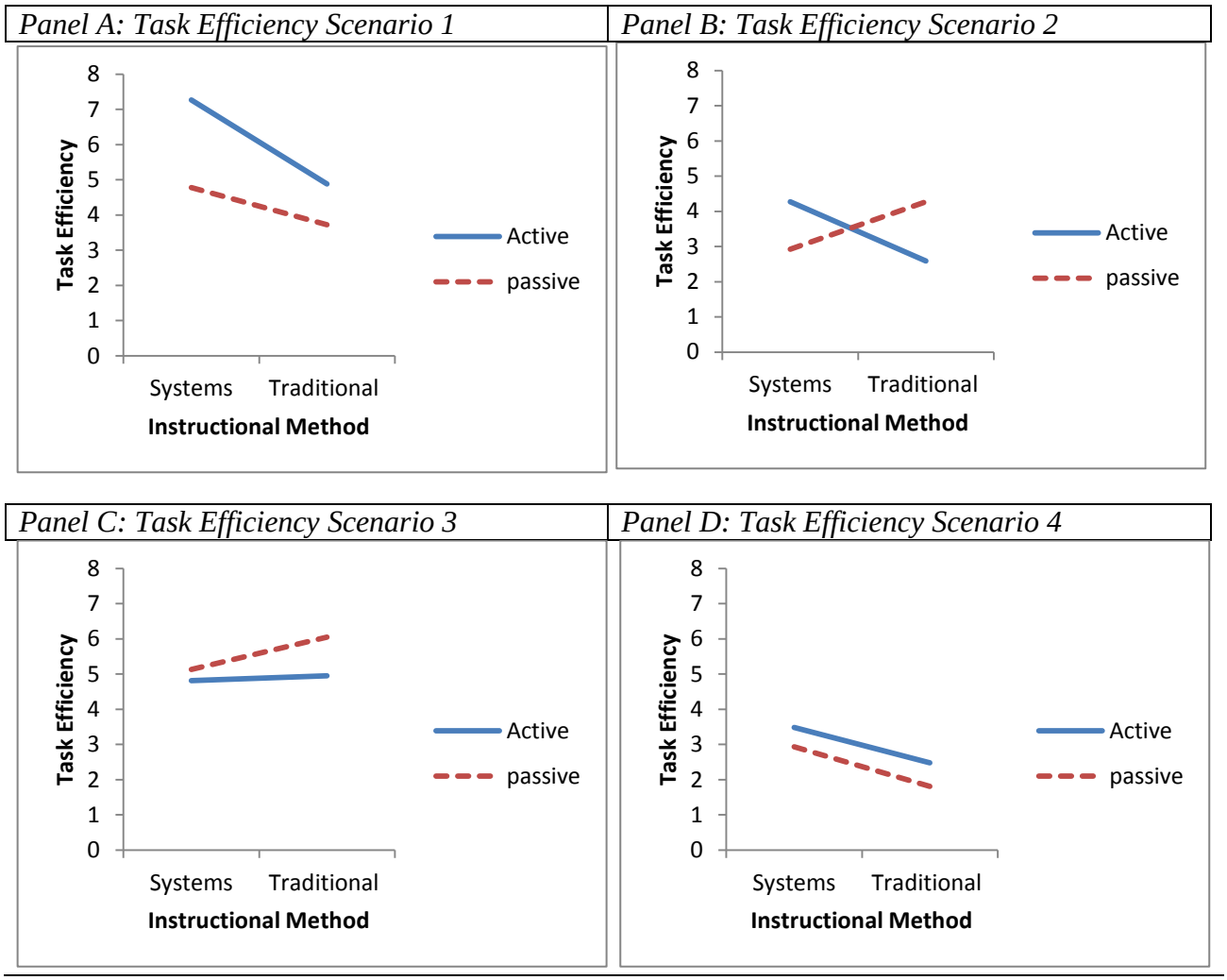
Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

Performance was measured in each individual scenario on a scale of 0 to 3, 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Figure 6
Task Efficiency



Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

Task efficiency was measured in each individual scenario as absolute performance/minutes spent on the task. A higher score for task efficiency indicated that the judgment was both correct and quickly made.

Table 1
Descriptive Statistics for Participants

Panel A: Descriptive Statistics: Participants

Variable	Minimum	Maximum	Mean	Std. Deviation
Age	20.00	60.00	28.42	9.09
Gender (0=male; 1=female)	0.00	1.00	0.47	0.50
GPA	0.00	4.00	3.25	0.58
Number of Accounting Internships	0.00	2.00	0.45	0.65
Corporate Tax Experience (0=no; 1=yes)	0.00	1.00	0.03	0.18
Tax Provision Experience (0=no; 1=yes)	0.00	1.00	0.05	0.22
Total minutes spent on training	12.99	40.94	24.53	6.25

Panel B: Descriptive Statistics: Participants by Condition

Variable	Systems/ Active N = 15	Systems/ Passive N = 15	Traditional/ Active N = 16	Traditional/ Passive N = 14
Age	27.53	27.07	28.75	30.43
Gender (0=male; 1=female)	0.33	0.53	0.38	0.64
GPA	3.19	3.17	3.24	3.42
Number of Accounting Internships	0.53	0.27	0.56	0.43
Corporate Tax Experience (0=no; 1=yes)	0.00	0.13	0.00	0.00
Tax Provision Experience (0=no; 1=yes)	0.07	0.07	0.00	0.07
Total minutes spent on training	24.33	22.32	25.18	26.34

Table 2
Descriptive Statistics for Pre-test Performance

Panel A: Descriptive Statistics: Pre-Test Performance

Variable	Minimum	Maximum	Mean	Std. Deviation
Pre-Test Scenario 1	0.00	3.00	1.90	0.88
Pre-Test Scenario 2	0.00	3.00	1.33	0.71
Pre-Test Scenario 3	0.00	3.00	1.23	0.91

Panel B: Descriptive Statistics: Pre-Test Performance by Condition

Variable	Systems/ Active N = 15	Systems/ Passive N = 15	Traditional/ Active N = 16	Traditional/ Passive N = 14
Pre-Test Scenario 1	2.40	1.60	1.88	1.71
Pre-Test Scenario 2	1.27	1.33	1.31	1.43
Pre-Test Scenario 3	1.53	0.80	1.25	1.36

Variable Definitions

Pre-test scenario 1 asked participants to indicate the impact that meals and entertainments would have on the three provision accounts.

Pre-test scenario 2 asked participants to indicate the impact a book-to-tax adjustment for bad debts would have on the three provision accounts.

Pre-test scenario3 asked participants to indicate the impact a book-to-tax adjustment for first-year depreciation would have on the three provision accounts.

Performance was measured in each individual scenario on a scale of 0 to 3, with 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Table 3
Descriptive Statistics for Change in Performance

Panel A: Descriptive Statistics: Change in Performance

Variable	Minimum	Maximum	Mean	Std. Deviation
Post Test Scenario 1 - Pre Test Scenario 1	-2.00	3.00	0.30	0.94
Post Test Scenario 2 - Pre Test Scenario 2	-2.00	2.00	-0.02	1.00
Post Test Scenario 3 - Pre Test Scenario 3	-2.00	3.00	0.53	1.19

Panel B: Descriptive Statistics: Change in Performance by Condition

Variable	Systems/ Active N = 15	Systems/ Passive N = 15	Traditional/ Active N = 16	Traditional/ Passive N = 14
Post Test Scenario 1 - Pre Test Scenario 1	0.27	0.73	0.00	0.21
Post Test Scenario 2 - Pre Test Scenario 2	0.13	-0.07	-0.25	0.14
Post Test Scenario 3 - Pre Test Scenario 3	0.13	0.87	0.31	0.86

Variable Definitions

Pre-test scenario 1 and *Post-test scenario 1* asked participants to indicate the impact that meals and entertainments would have on the three provision accounts.

Pre-test scenario 2 and *Post-test scenario 2* asked participants to indicate the impact a book-to-tax adjustment for bad debts would have on the three provision accounts.

Pre-test scenario3 and *Post-test scenario 3* asked participants to indicate the impact a book-to-tax adjustment for first-year depreciation would have on the three provision accounts.

Performance was measured in each individual scenario on a scale of 0 to 3, with 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Table 4
Test of Hypotheses using Scenario 1

Panel A: Performance, Scenario 1 Means (Standard Deviation)

		Instructional Method		
		Systems	**Traditional**	***Totals***
Practice Method	**Active**	2.67 (.49) N= 15	1.88 (.89) N= 16	2.26 (.82) N= 31
	Passive	2.33 (.90) N= 15	1.93 (.73) N= 14	2.14 (.83) N= 29
	Totals	2.50 (.73) N= 30	1.90 (.80) N= 30	2.20 (.82) N= 60

Panel B: ANCOVA of Performance on Scenario 1

Factor	**Df**	**Sum of Squares**	**Mean Square**	**F**	**p-value[a]**
Instructional Method	1	4.20	4.20	7.85	0.007
Practice Method	1	0.00	0.00	0.00	0.958
Inst. M. x Prac. M.	1	0.13	0.13	0.24	0.630
Pre-Test Scenario 1	1	3.90	3.90	7.29	0.009
Error	55	29.44	0.54		

[a] Reported p-values are *two-tailed*

Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

Performance was measured in each individual scenario on a scale of 0 to 3, 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Pre-test scenario 1 asked participants to indicate the impact that meals and entertainments would have on the three provision accounts.

Table 5
Test of Hypotheses using Scenario 2

Panel A: Performance, Scenario 2 Means (Standard Deviation)

		Instructional Method		
		Systems	**Traditional**	***Totals***
Practice Method	**Active**	1.40 (.83) N= 15	1.06 (.85) N= 16	1.23 (.85) N= 31
	Passive	1.27 (.80) N= 15	1.57 (1.09) N= 14	1.41 (.94) N= 29
	Totals	1.33 (.80) N= 30	1.30 (.99) N= 30	1.32 (.89) N= 60

Panel B: ANCOVA of Performance on Scenario 2

Factor	Df	Sum of Squares	Mean Square	F	p-value[a]
Instructional Method	1	0.02	0.02	0.03	0.873
Practice Method	1	0.39	0.39	0.5	0.481
Inst. M. x Prac. M.	1	1.48	1.48	1.91	0.173
Pre-Test Scenario 2	1	2.38	2.38	3.08	0.085
Error	55	42.52	0.77		

[a] Reported p-values are *two-tailed*

Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

Performance was measured in each individual scenario on a scale of 0 to 3, 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Pre-test scenario 2 asked participants to indicate the impact a book to tax adjustment for bad debts would have on the three provision accounts.

Table 6
Test of Hypotheses using Scenario 3

Panel A: Performance, Scenario 3 Means (Standard Deviation)

		Instructional Method		
		Systems	**Traditional**	***Totals***
Practice Method	**Active**	1.67 (1.18) N=15	1.56 (1.03) N=16	1.61 (1.09) N=31
	Passive	1.67 (1.29) N=15	2.21 (1.05) N=14	1.93 (1.19) N=29
	Totals	1.67 (1.21) N=30	1.87 (1.07) N=30	1.77 (1.14) N=60

Panel B: ANCOVA of Performance on Scenario 3

Factor	Df	Sum of Squares	Mean Square	F	p-value[a]
Instructional Method	1	0.38	0.38	0.33	0.571
Practice Method	1	3.19	3.19	2.76	0.102
Inst. M. x Prac. M.	1	0.25	0.25	0.22	0.644
Pre-Test Scenario 3	1	9.33	9.33	8.07	0.006
Error	55	63.63	1.157		

[a] Reported p-values are *two-tailed*

Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

Performance was measured in each individual scenario on a scale of 0 to 3, 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Pre-test scenario3 asked participants to indicate the impact a book to tax adjustment for first year depreciation would have on the three provision accounts.

Table 7
Test of Hypotheses using Scenario 4

Panel A: Performance, Scenario 4 Means (Standard Deviation)

		Instructional Method		
		Systems	**Traditional**	***Totals***
Practice Method	**Active**	1.40 (.83) N= 15	0.88 (.89) N= 16	1.13 (.88) N= 31
	Passive	1.07 (1.22) N= 15	0.86 (.66) N= 14	.97 (.98) N= 29
	Totals	1.23 (1.04) N= 30	.87 (.78) N=30	1.05 (.93) N= 60

Panel B: ANOVA of Performance on Scenario 4

Factor	Df	Sum of Squares	Mean Square	F	p-value[a]
Instructional Method	1	2.02	2.02	2.36	0.130
Practice Method	1	0.46	0.46	0.54	0.466
Inst. M. x Prac. M.	1	0.37	0.37	0.43	0.513
Error	56	48.00	0.86		

[a] Reported p-values are *two-tailed*

Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

Performance was measured in each individual scenario on a scale of 0 to 3, 0 being incorrect on all three provision accounts and 3 being correct on all three provision accounts.

Table 8
Test of Research Question using Scenario 1

Panel A: Task Efficiency Q1 Mean (Standard Deviation)

		Instructional Method		
		Systems	**Traditional**	***Totals***
Practice Method	**Active**	7.27 (3.84) N=15	4.88 (3.13) N=16	6.04 (3.64) N=31
	Passive	4.78 (2.33) N=15	3.72 (1.59) N=14	4.27 (2.04) N=30
	Totals	6.02 (3.37) N=30	4.34 (2.56) N=30	5.18 (3.08) N=60

Panel B: ANCOVA of Task Efficiency on Scenario 1

Factor	Df	Sum of Squares	Mean Square	F	p-value[a]
Instructional Method	1	33.88	33.88	4.41	0.040
Practice Method	1	24.95	24.95	3.25	0.077
Inst. M. x Prac. M.	1	1.69	1.69	0.22	0.641
Pre-Test Scenario 3	1	40.21	40.21	5.23	0.026
Error	55	422.72	7.686		

[a] Reported p-values are *two-tailed*

Variable Definitions

Instructional Method was manipulated by having participants view a *Systems* presentation (flowchart) or a *Traditional* presentation (list) of the tax provision concepts.

Practice Method was manipulated by having participants view *Active* practice questions or *Passive* practice questions. The *Active* questions allowed the participant to attempt each question three times before the solution was shown. The *Passive* questions only instructed the participant to think about the correct answer before it was shown.

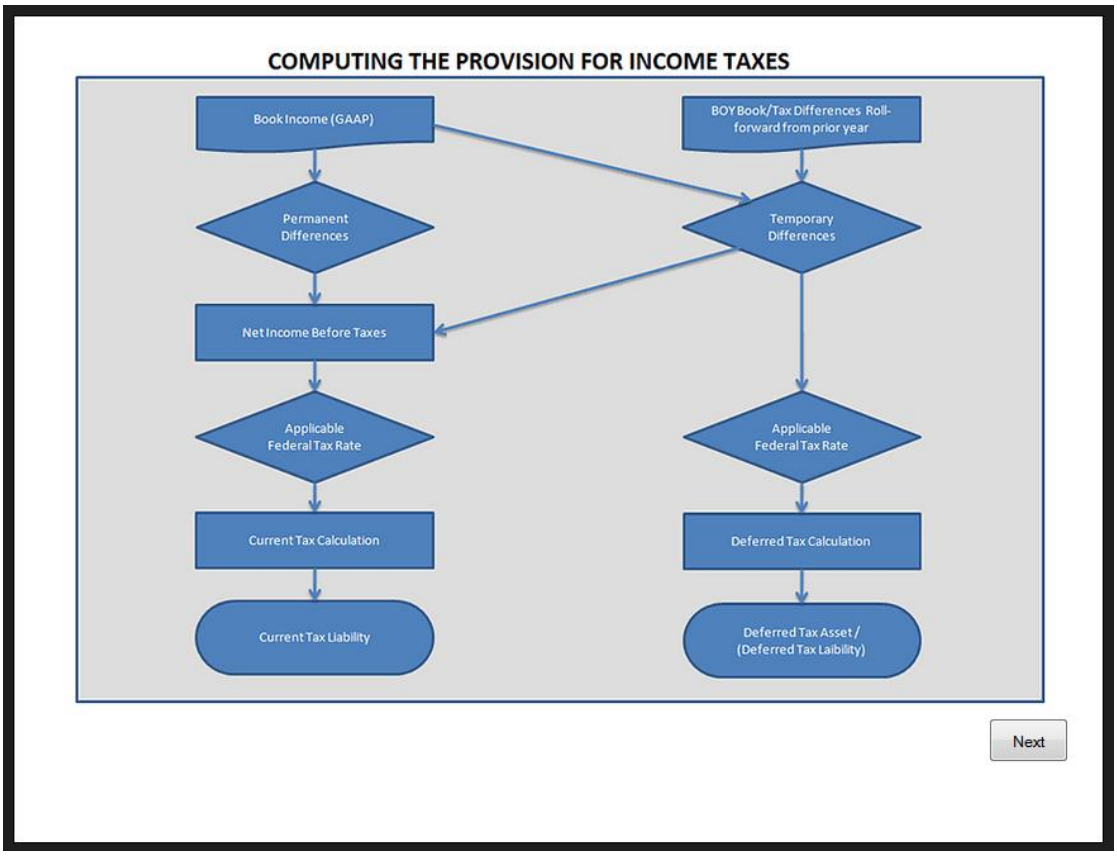
Task efficiency was measured in each individual scenario as absolute performance/minutes spent on the task. A higher score for task efficiency indicated that the judgment was both correct and quickly made.

Pre-test scenario 1 asked participants to indicate the impact that meals and entertainments would have on the three provision accounts.

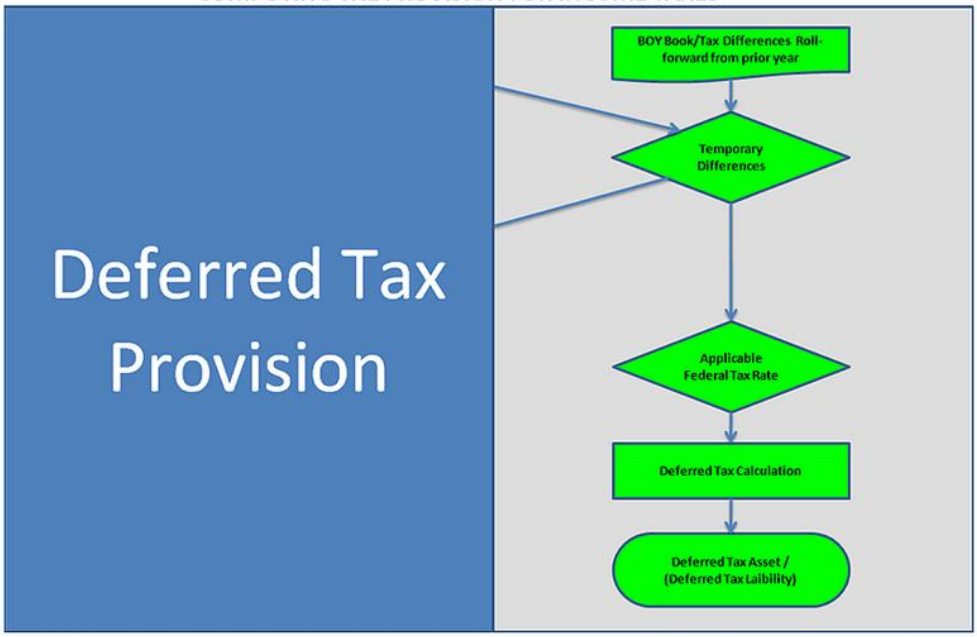
Appendix A: Selected Conditional Screenshots of Experimental Instrument

Screenshots dependent on experimental condition are shown in the following order: Systems, Traditional, Active, and Passive.

Systems Training Condition Screenshots

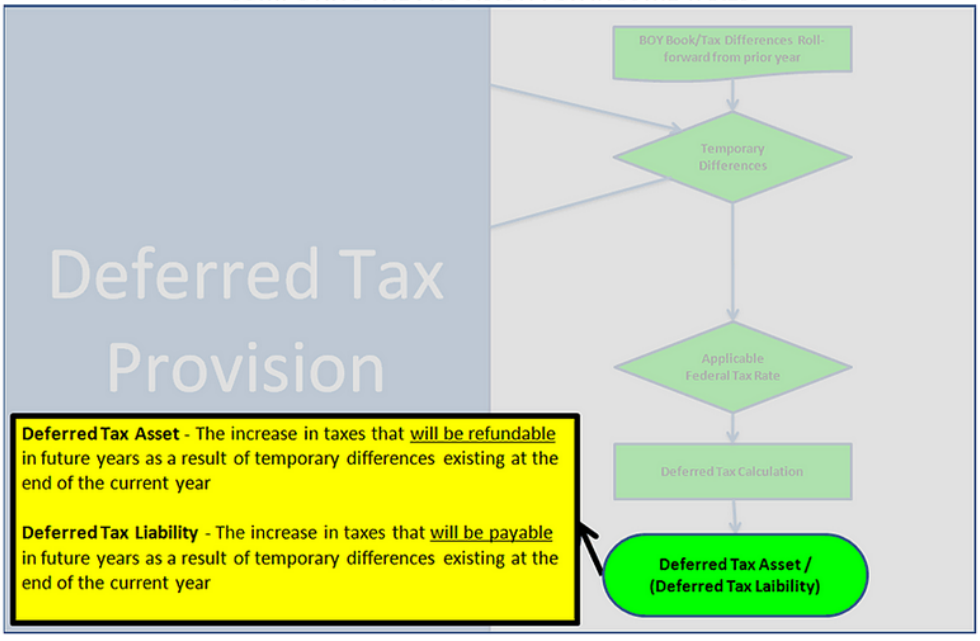


COMPUTING THE PROVISION FOR INCOME TAXES



Next

COMPUTING THE PROVISION FOR INCOME TAXES



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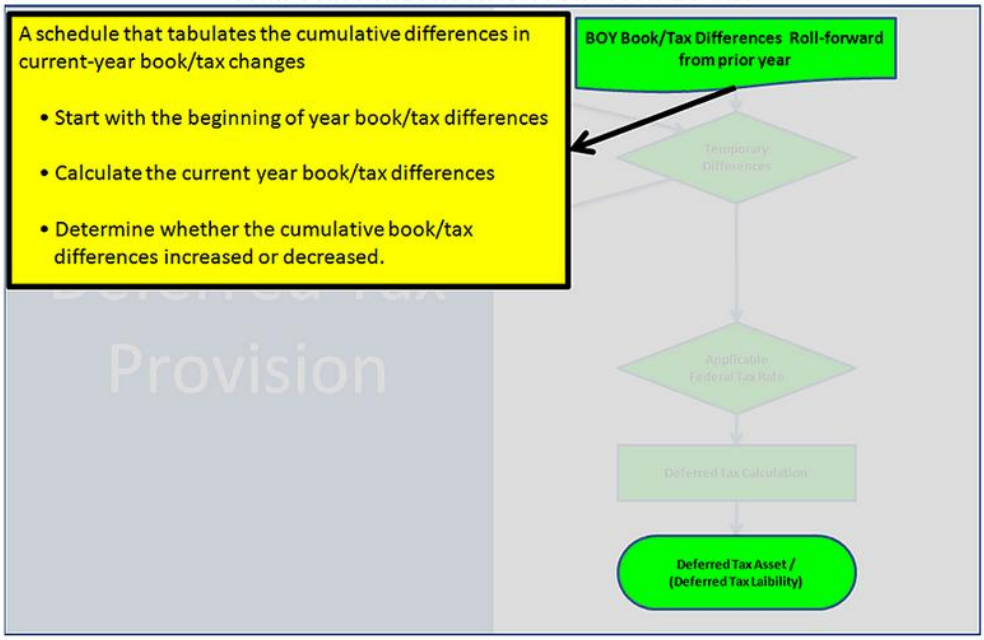
COMPUTING THE PROVISION FOR INCOME TAXES



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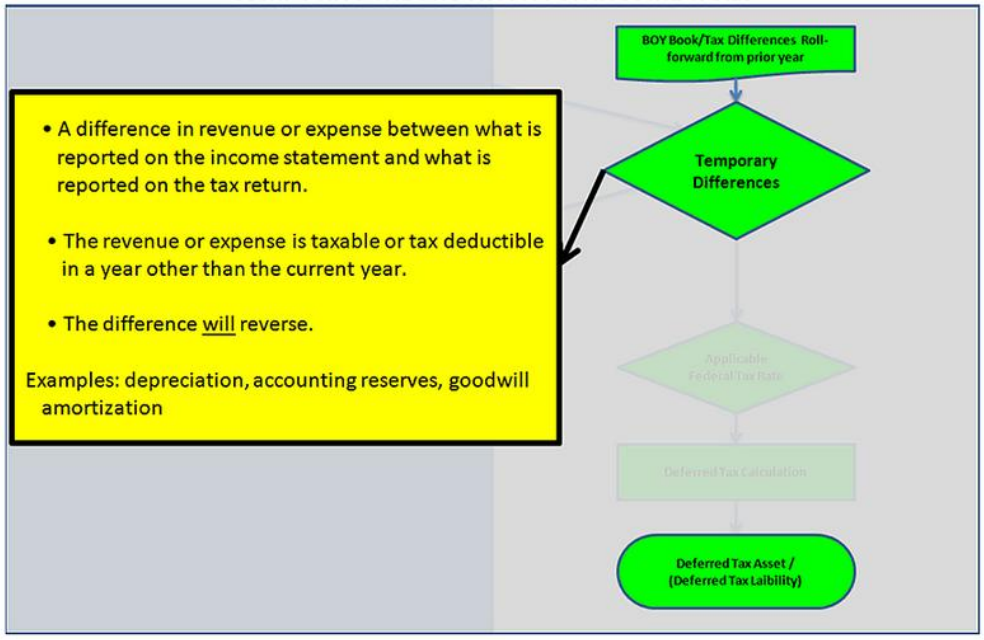
COMPUTING THE PROVISION FOR INCOME TAXES



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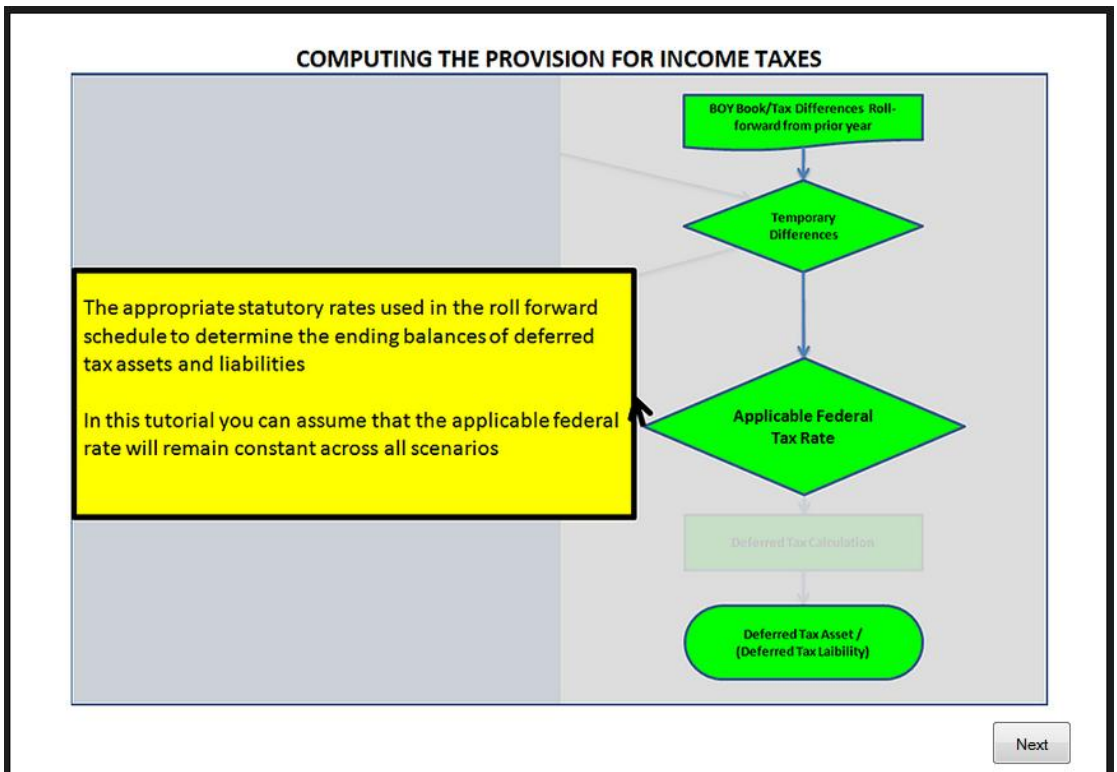
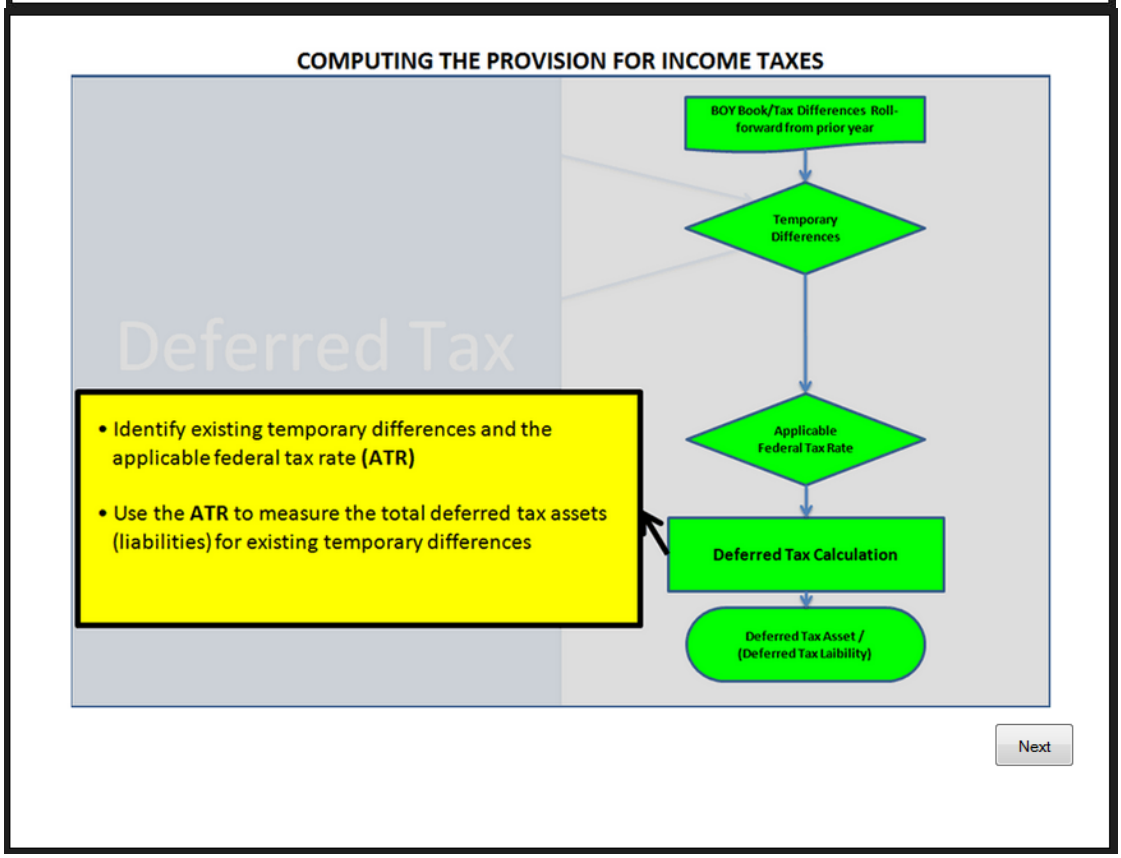
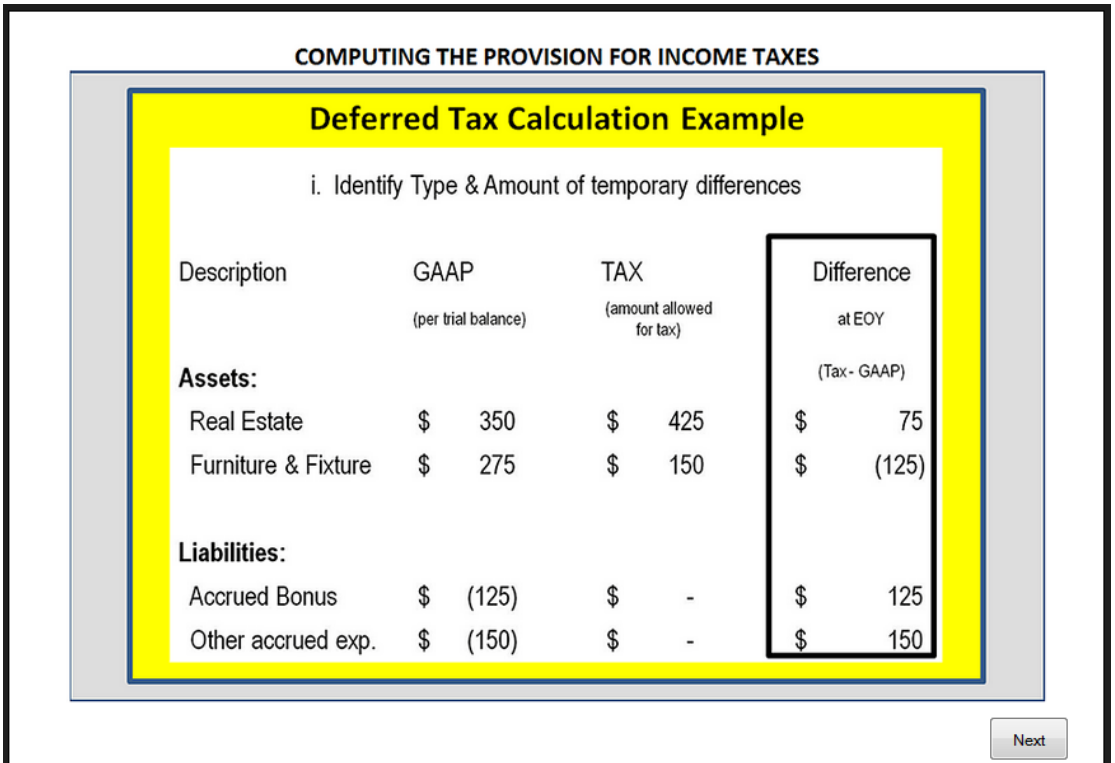
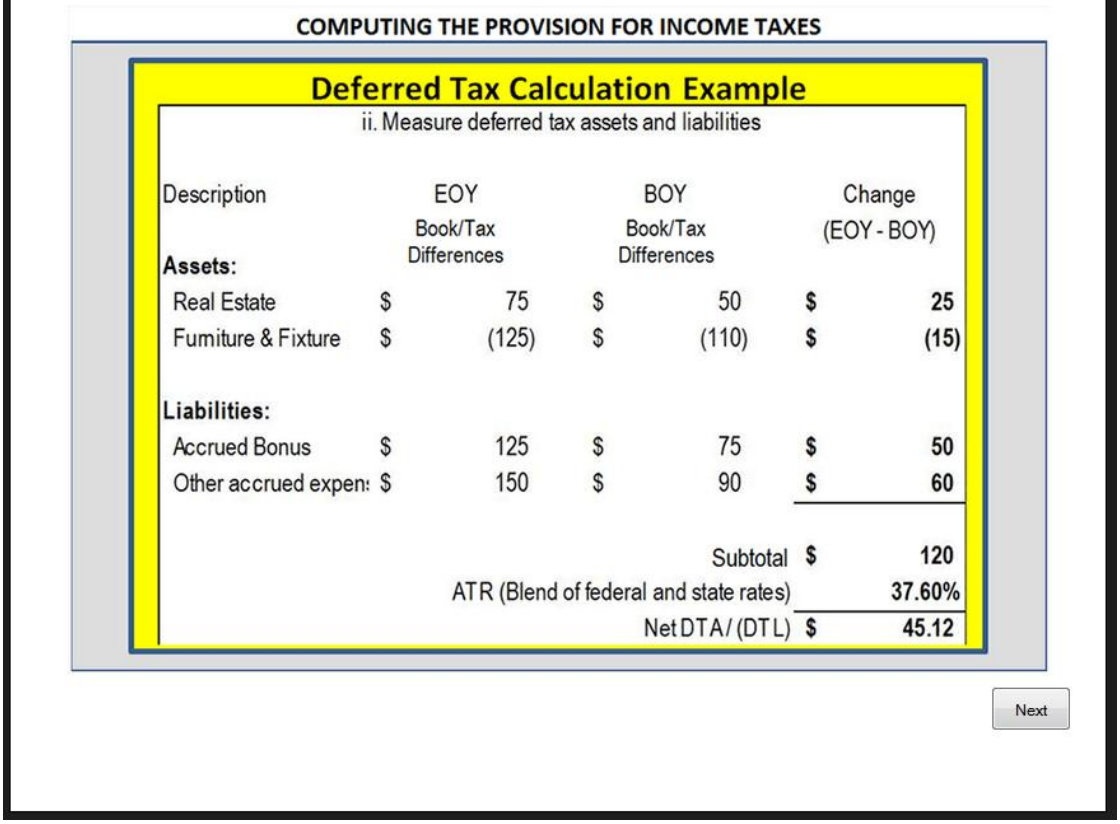
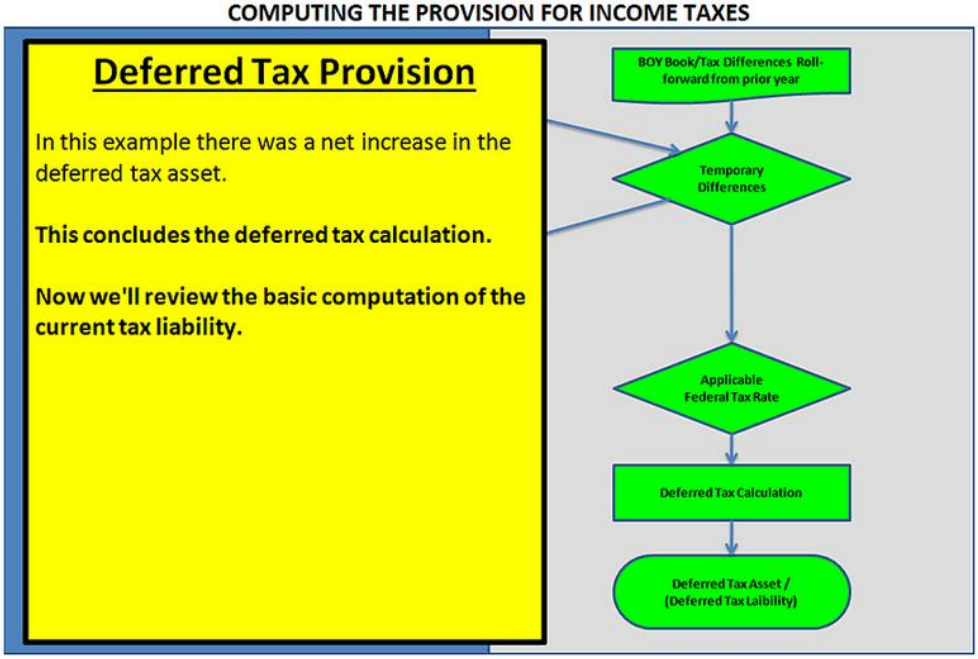

COMPUTING THE PROVISION FOR INCOME TAXES
BOY Book/Tax Differences Roll-forward from prior year
Temporary Differences
The appropriate statutory rates used in the roll forward schedule to determine the ending balances of deferred tax assets and liabilities
In this tutorial you can assume that the applicable federal rate will remain constant across all scenarios
Applicable Federal Tax Rate
Deferred Tax Calculation
Deferred Tax Asset / (Deferred Tax Liability)
Next


COMPUTING THE PROVISION FOR INCOME TAXES
BOY Book/Tax Differences Roll-forward from prior year
Temporary Differences
Deferred Tax
• Identify existing temporary differences and the applicable federal tax rate (ATR)
• Use the ATR to measure the total deferred tax assets (liabilities) for existing temporary differences
Applicable Federal Tax Rate
Deferred Tax Calculation
Deferred Tax Asset / (Deferred Tax Liability)
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Deferred Tax Calculation Example
i. Identify Type & Amount of temporary differences
Description
GAAP
(per trial balance)
TAX
(amount allowed for tax)
Difference at EOY
(Tax - GAAP)
Assets:
Real Estate $ 350 $ 425 $ 75
Furniture & Fixture $ 275 $ 150 $ (125)
Liabilities:
Accrued Bonus $ (125) $ - $ 125
Other accrued exp. $ (150) $ - $ 150
Next

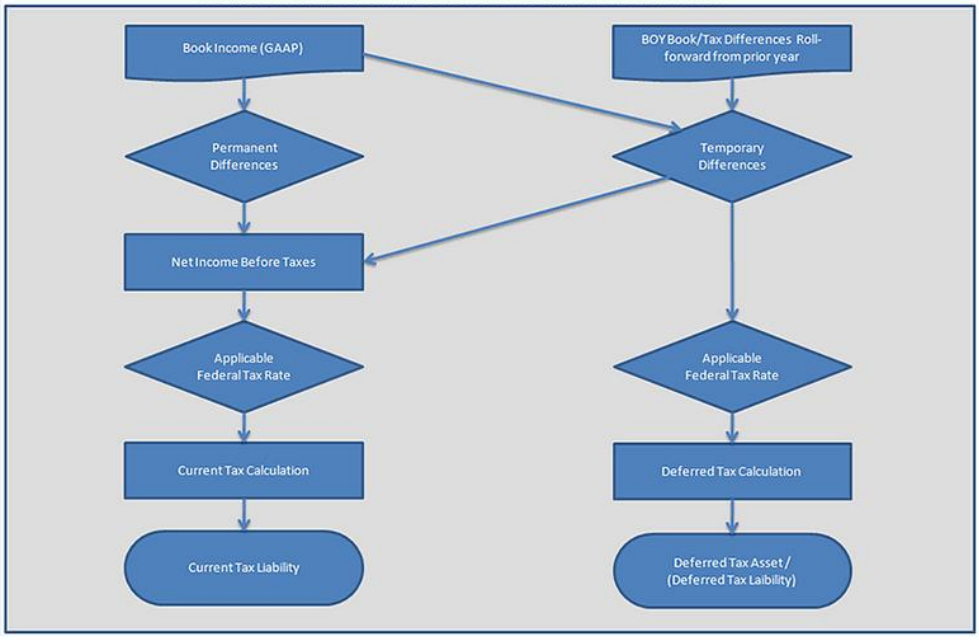

COMPUTING THE PROVISION FOR INCOME TAXES
Deferred Tax Calculation Example
ii. Measure deferred tax assets and liabilities
Description
EOY Book/Tax Differences
BOY Book/Tax Differences
Change (EOY - BOY)
Assets:
Real Estate $ 75 $ 50 $ 25
Furniture & Fixture $ (125) $ (110) $ (15)
Liabilities:
Accrued Bonus $ 125 $ 75 $ 50
Other accrued expen: $ 150 $ 90 $ 60
Subtotal $ 120
ATR (Blend of federal and state rates) 37.60%
Net DTA / (DTL) $ 45.12
Next

COMPUTING THE PROVISION FOR INCOME TAXES

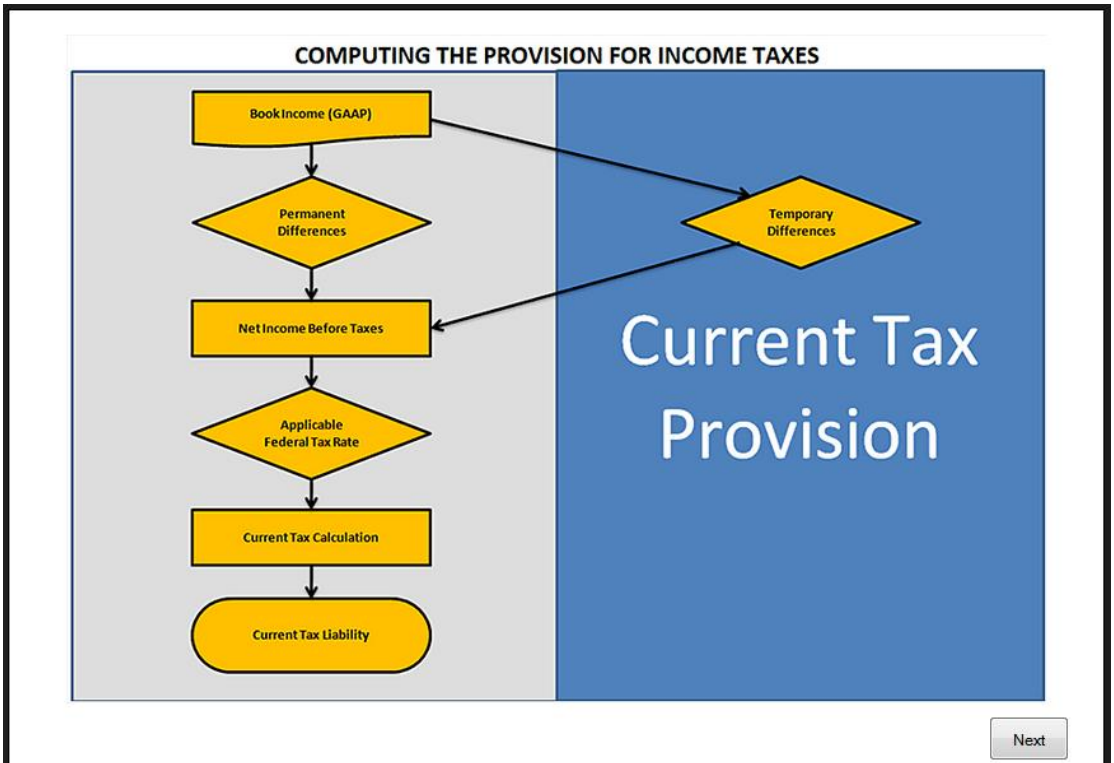


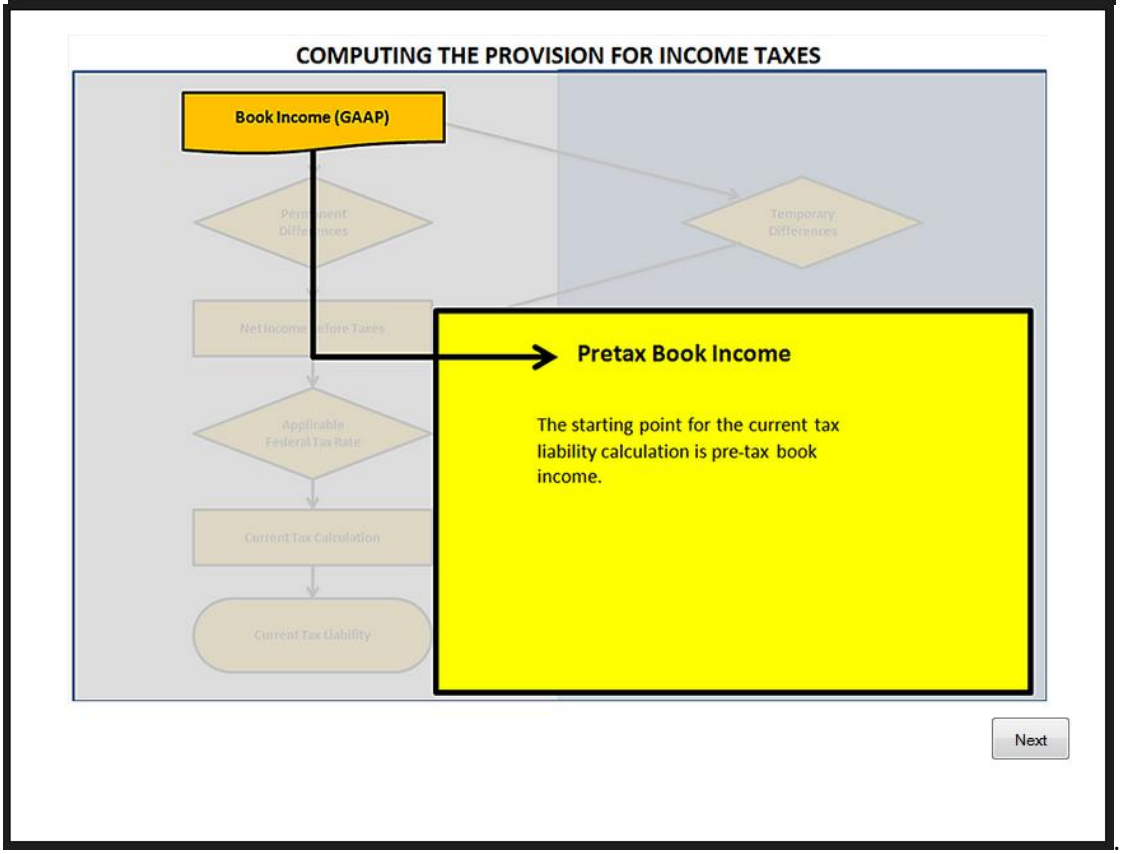
Next

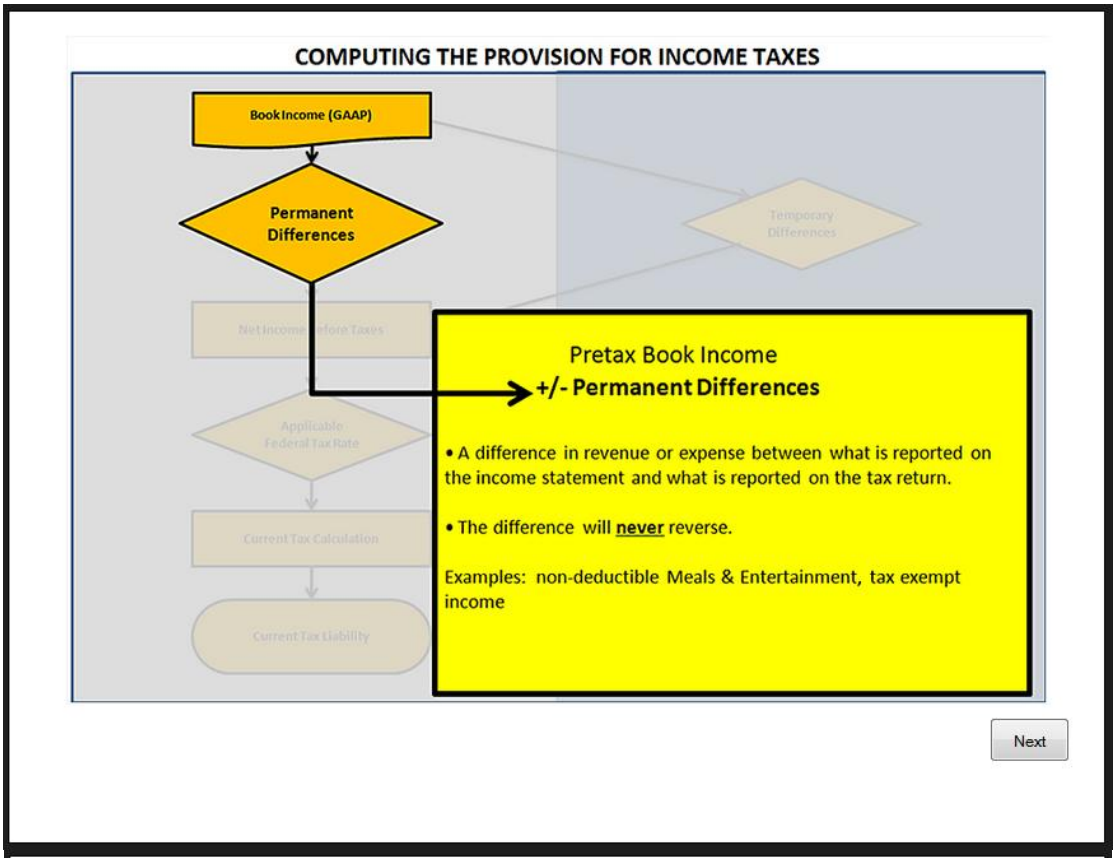
COMPUTING THE PROVISION FOR INCOME TAXES

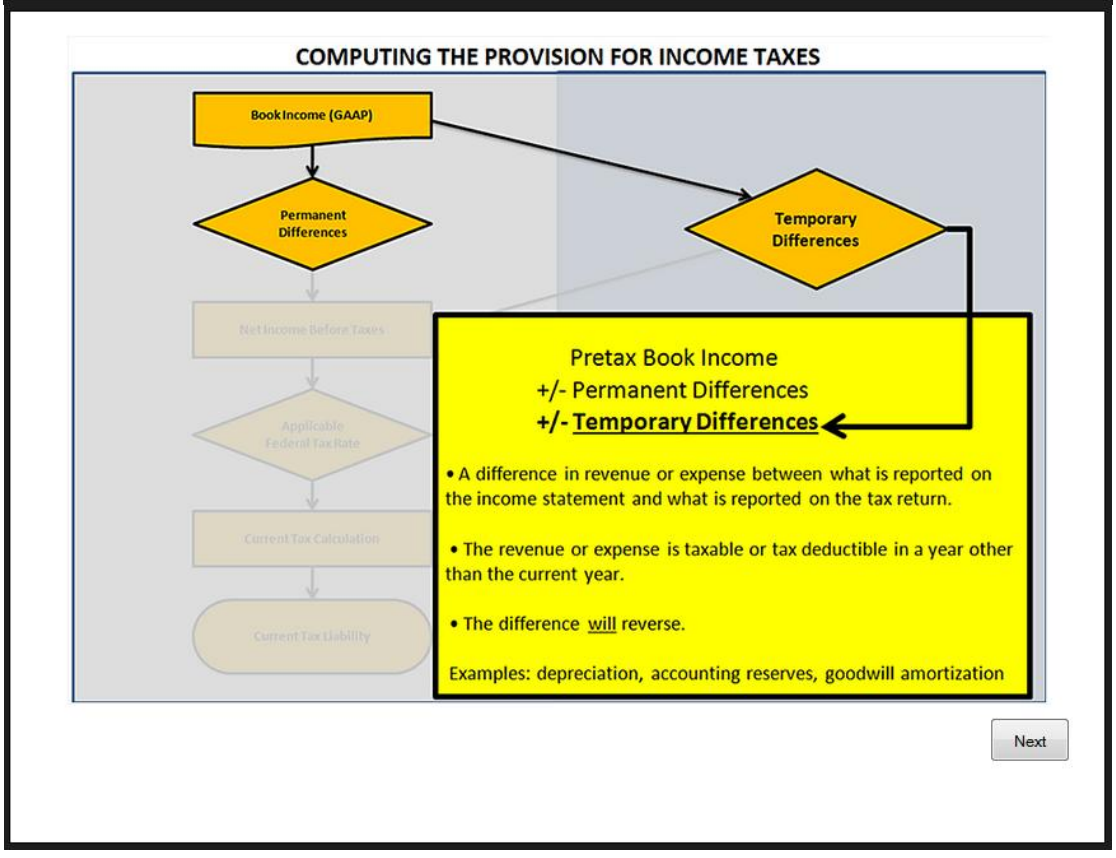


Next


COMPUTING THE PROVISION FOR INCOME TAXES
Book Income (GAAP)
Permanent Differences
Temporary Differences
Net Income Before Taxes
Applicable Federal Tax Rate
Current Tax Calculation
Current Tax Liability
Current Tax Provision
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Book Income (GAAP)
Pretax Book Income
The starting point for the current tax liability calculation is pre-tax book income.
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Book Income (GAAP)
Permanent Differences
Temporary Differences
Net Income Before Taxes
Applicable Federal Tax Rate
Current Tax Calculation
Current Tax Liability
Pretax Book Income
+/- Permanent Differences
• A difference in revenue or expense between what is reported on the income statement and what is reported on the tax return.
• The difference will never reverse.
Examples: non-deductible Meals & Entertainment, tax exempt income
Next


COMPUTING THE PROVISION FOR INCOME TAXES
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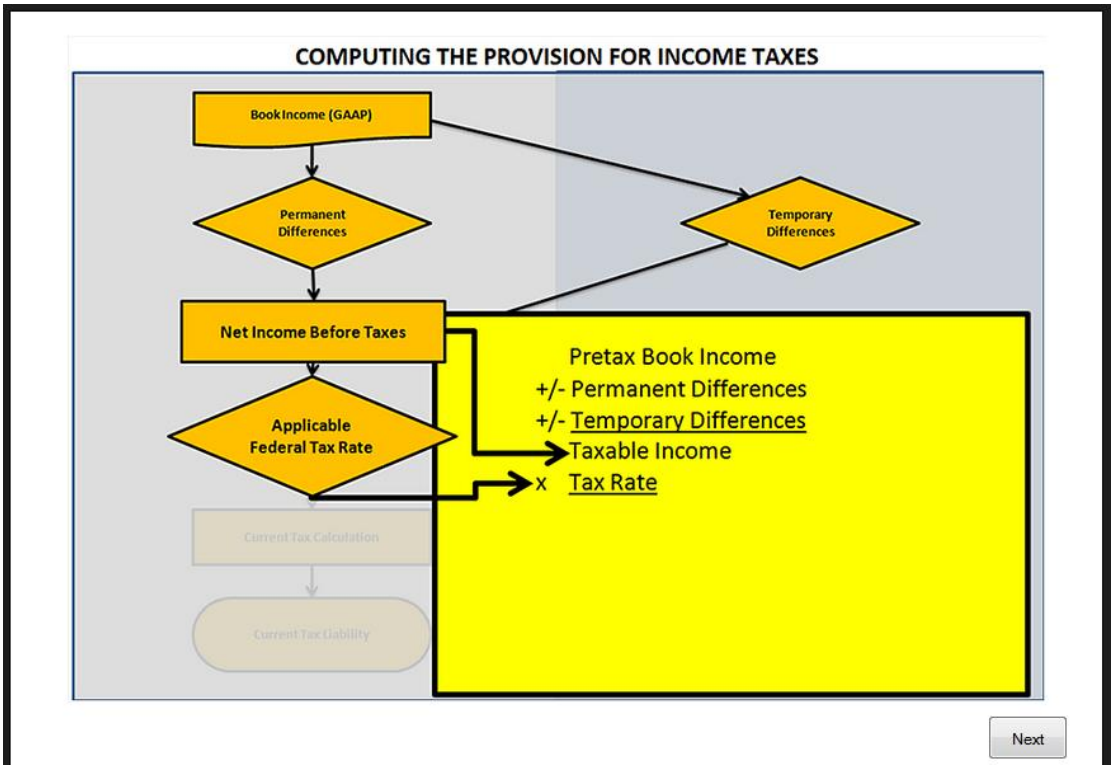
Examples: depreciation, accounting reserves, goodwill amortization
Next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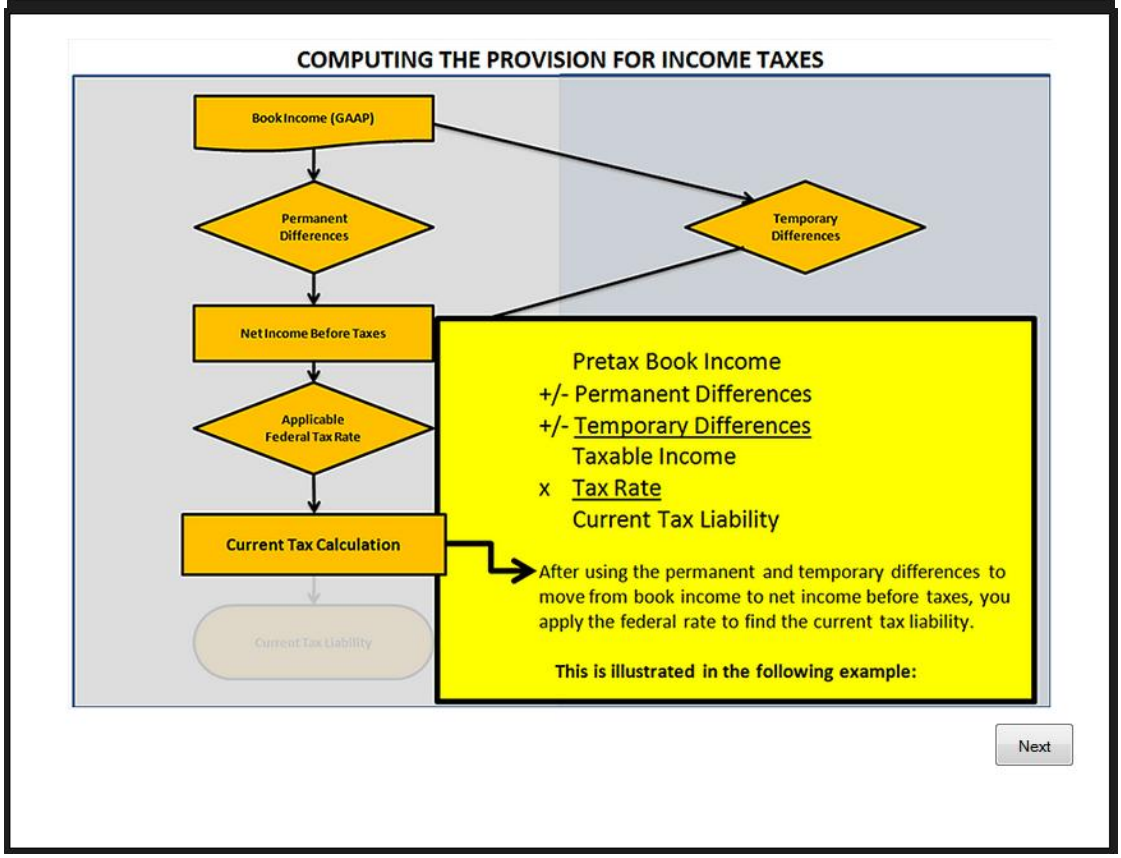
Book Income (GAAP)
Permanent Differences
Temporary Differences
Net Income Before Taxes
Applicable Federal Tax Rate
Current Tax Calculation
Current Tax Liability
Pretax Book Income
+/- Permanent Differences
+/- Temporary Differences
Taxable Income
x Tax Rate
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Book Income (GAAP)
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Net Income Before Taxes
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Taxable Income
x Tax Rate
Current Tax Liability
After using the permanent and temporary differences to move from book income to net income before taxes, you apply the federal rate to find the current tax liability.
This is illustrated in the following example:
Next

COMPUTING THE PROVISION FOR INCOME TAXES

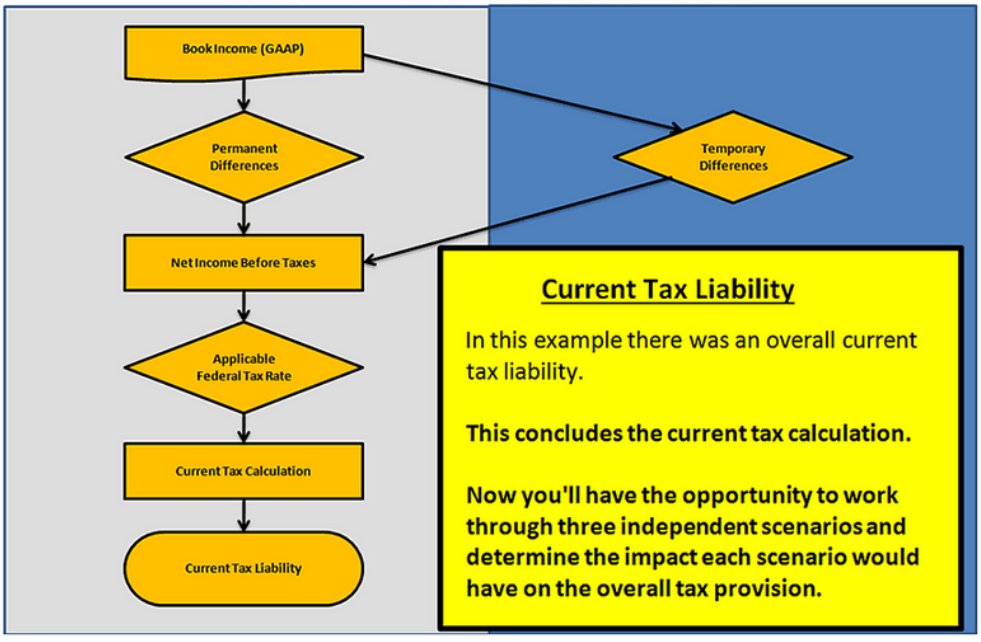
This continues the example started in the deferred tax calulation

Current Tax Calculation

	Income/(deduction)
Pre-tax book income	$ 9
Book-Tax Adjustments	
Permanent Items	
Tax exempt income	$ (55)
Nondeductible meals & ent.	$ 15
Temporary Items	
Real Estate	$ 25
Furniture & Fixture	$ (15)
Accrued Bonus	$ 50
Other accrued expenses	$ 60
Taxable Income	$ 89
ATR (Blend of federal and state rates)	37.60%
Current Tax Expense	**$ 33**

Next

COMPUTING THE PROVISION FOR INCOME TAXES



Current Tax Liability

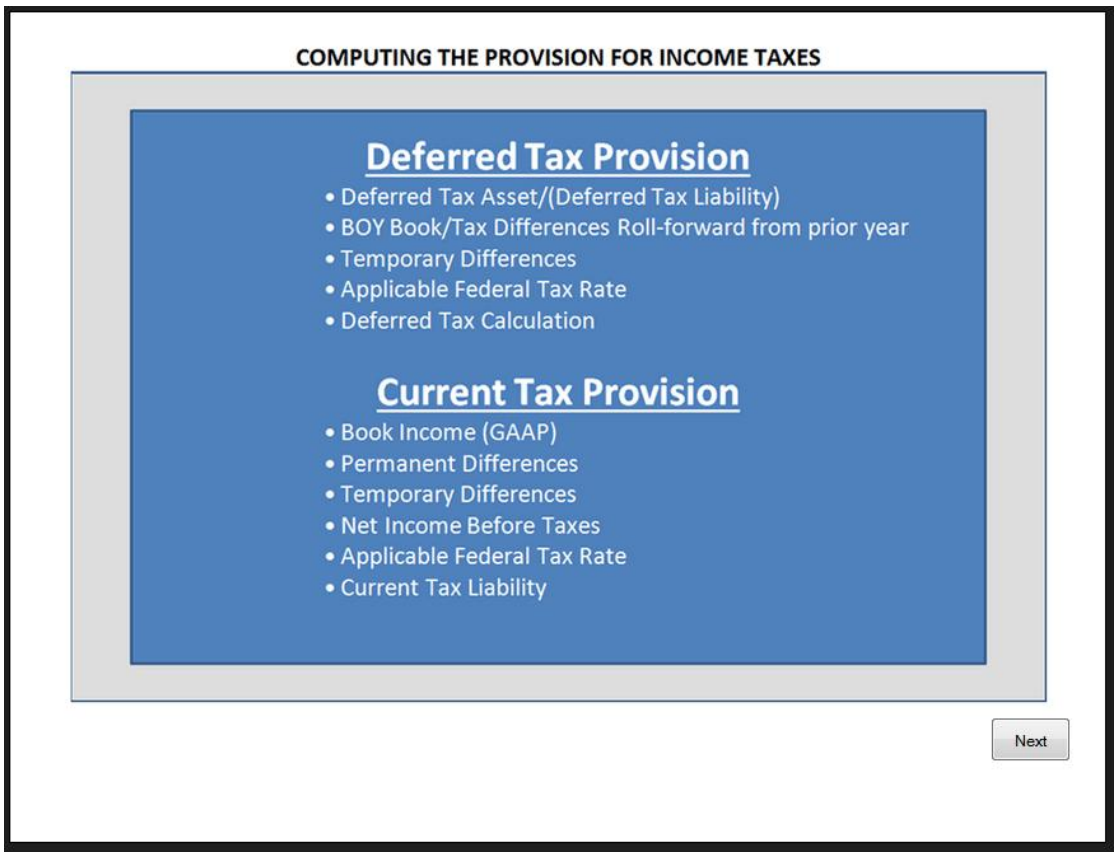
In this example there was an overall current tax liability.

This concludes the current tax calculation.

Now you'll have the opportunity to work through three independent scenarios and determine the impact each scenario would have on the overall tax provision.

Next

Traditional Training Condition Screenshots



COMPUTING THE PROVISION FOR INCOME TAXES

Deferred Tax Provision

- Deferred Tax Asset/(Deferred Tax Laibility)
- BOY Book/Tax Differences Roll-forward from prior year
- Temporary Differences
- Applicable Federal Tax Rate
- Deferred Tax Calculation

Next

COMPUTING THE PROVISION FOR INCOME TAXES

Deferred Tax Asset/(Deferred Tax Liability)

Deferred Tax Asset – The increase in taxes that will be refundable in future years as a result of temporary differences existing at the end of the current year

Deferred Tax Liability – The increase in taxes that will be payable in future years as a result of temporary differences existing at the end of the current year

Next

COMPUTING THE PROVISION FOR INCOME TAXES

BOY Book/Tax Differences Roll-forward

A schedule that tabulates the cumulative differences in current-year book/tax changes

- Start with the beginning of year book/tax differences
- Calculate the current year book/tax differences
- Determine whether the cumulative book/tax differences increased or decreased.

Next

COMPUTING THE PROVISION FOR INCOME TAXES

Temporary Differences

- A difference in revenue or expense between what is reported on the income statement and what is reported on the tax return.
- The revenue or expense is taxable or tax deductible in a year other than the current year.
- The difference will reverse.

Examples: depreciation, accounting reserves, goodwill amortization

Next

COMPUTING THE PROVISION FOR INCOME TAXES

Applicable Federal Tax Rate

The appropriate statutory rates used in the roll forward schedule to determine the ending balances of deferred tax assets and liabilities

In this tutorial you can assume that the applicable federal rate will remain constant across all scenarios

Next

COMPUTING THE PROVISION FOR INCOME TAXES

Deferred Tax Calculation

- Identify existing temporary differences and the applicable federal tax rate **(ATR)**
- Use the **ATR** to measure the total deferred tax assets (liabilities) for existing temporary differences

Next

COMPUTING THE PROVISION FOR INCOME TAXES

Deferred Tax Calculation Example

i. Identify Type & Amount of temporary differences

Description	GAAP (per trial balance)	TAX (amount allowed for tax)	Difference at EOY (Tax - GAAP)
Assets:			
Real Estate	$ 350	$ 425	$ 75
Furniture & Fixture	$ 275	$ 150	$ (125)
Liabilities:			
Accrued Bonus	$ (125)	$ -	$ 125
Other accrued exp.	$ (150)	$ -	$ 150

Next

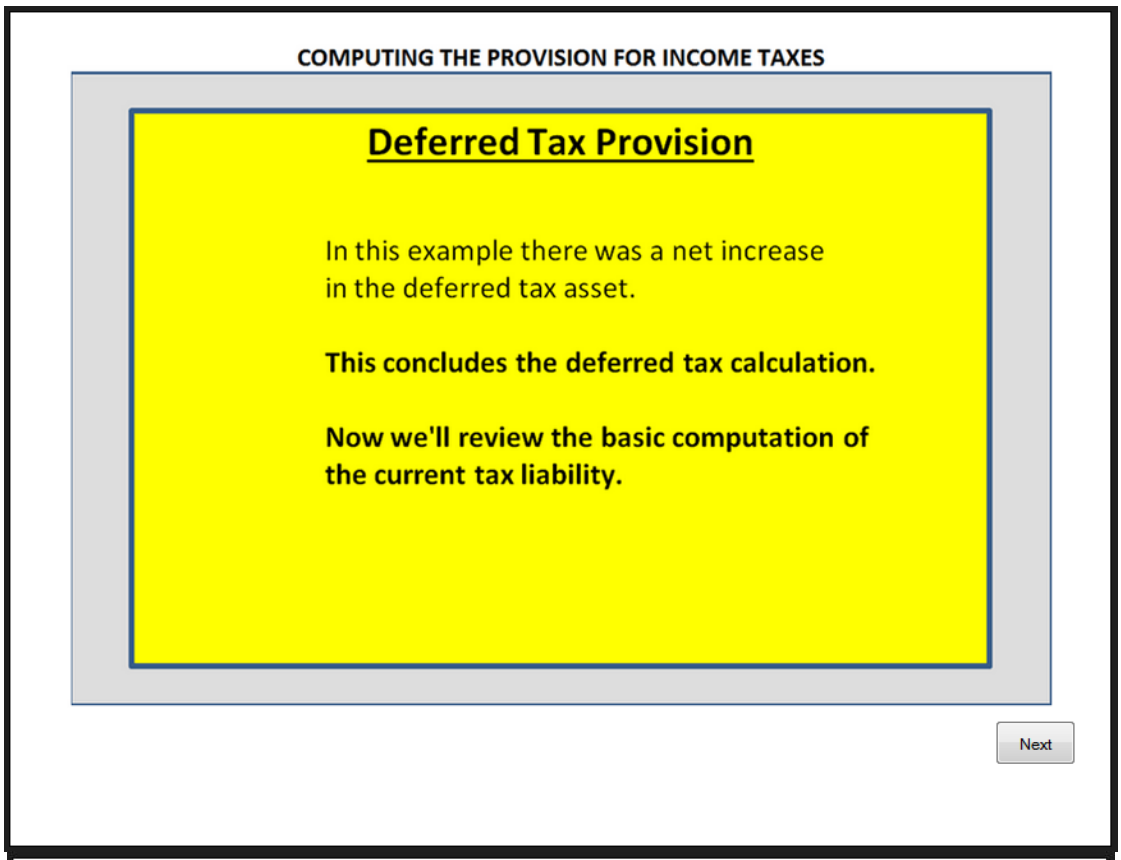
COMPUTING THE PROVISION FOR INCOME TAXES

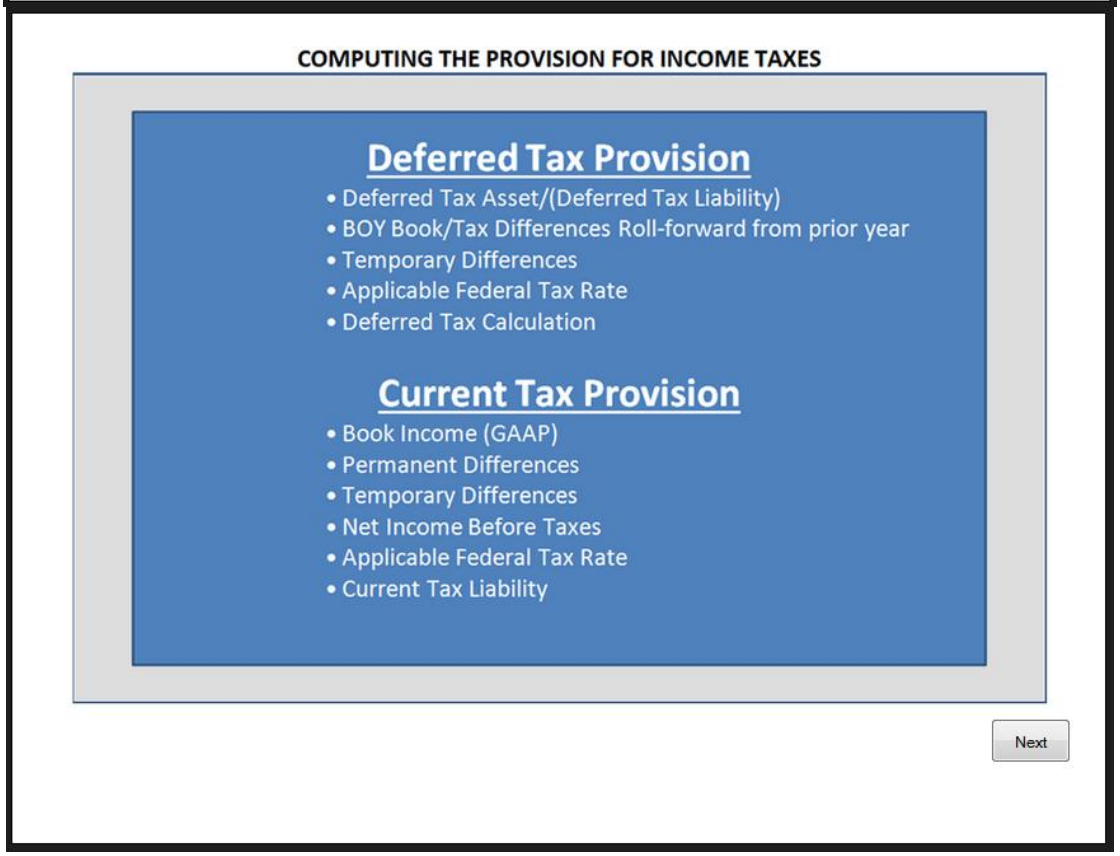
Deferred Tax Calculation Example

ii. Measure deferred tax assets and liabilities

Description	EOY Book/Tax Differences	BOY Book/Tax Differences	Change (EOY - BOY)
Assets:			
Real Estate	$ 75	$ 50	**$ 25**
Furniture & Fixture	$ (125)	$ (110)	**$ (15)**
Liabilities:			
Accrued Bonus	$ 125	$ 75	**$ 50**
Other accrued expen:	$ 150	$ 90	**$ 60**
		Subtotal	**$ 120**
		ATR (Blend of federal and state rates)	**37.60%**
		Net DTA / (DTL)	**$ 45.12**

Next


COMPUTING THE PROVISION FOR INCOME TAXES
Deferred Tax Provision
In this example there was a net increase in the deferred tax asset.
This concludes the deferred tax calculation.
Now we'll review the basic computation of the current tax liability.
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Deferred Tax Provision
• Deferred Tax Asset/(Deferred Tax Liability)
• BOY Book/Tax Differences Roll-forward from prior year
• Temporary Differences
• Applicable Federal Tax Rate
• Deferred Tax Calculation
Current Tax Provision
• Book Income (GAAP)
• Permanent Differences
• Temporary Differences
• Net Income Before Taxes
• Applicable Federal Tax Rate
• Current Tax Liability
Next

COMPUTING THE PROVISION FOR INCOME TAXES

Current Tax Provision

- Book Income (GAAP)
- Permanent Differences
- Temporary Differences
- Net Income Before Taxes
- Applicable Federal Tax Rate
- Current Tax Liability

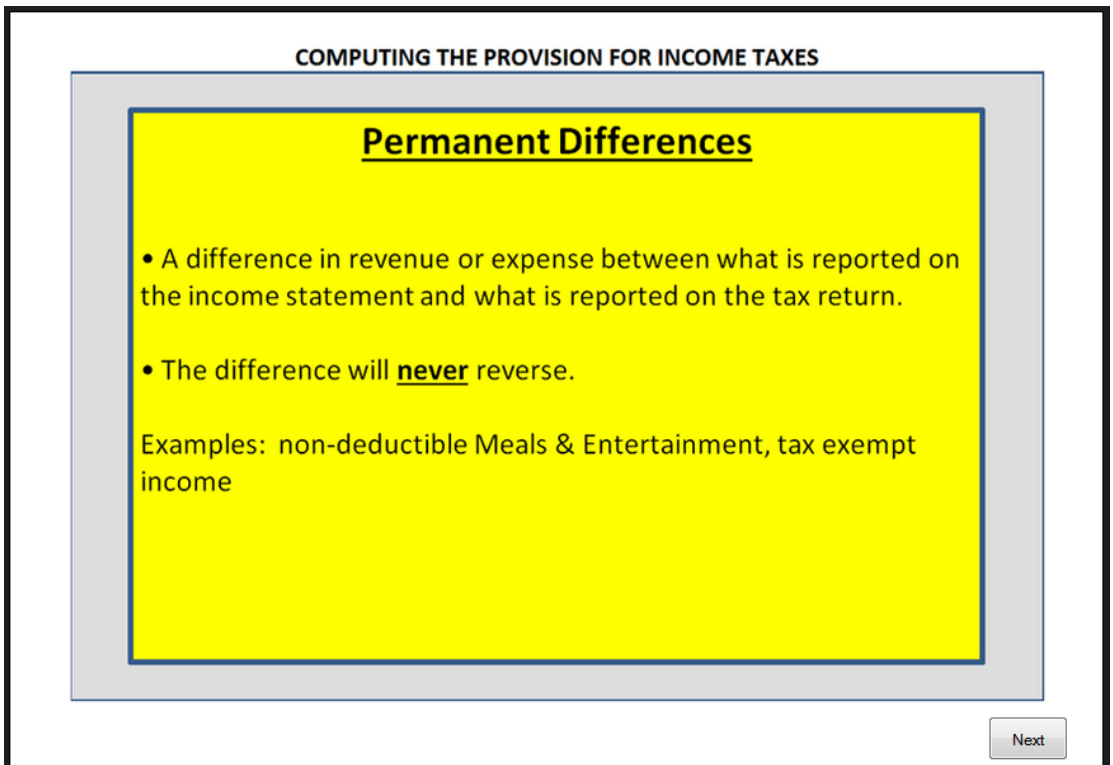
Next

COMPUTING THE PROVISION FOR INCOME TAXES

Book Income (GAAP)

The starting point for the current tax liability calculation is pre-tax book income.

Next


COMPUTING THE PROVISION FOR INCOME TAXES
Permanent Differences
• A difference in revenue or expense between what is reported on the income statement and what is reported on the tax return.
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Examples: non-deductible Meals & Entertainment, tax exempt income
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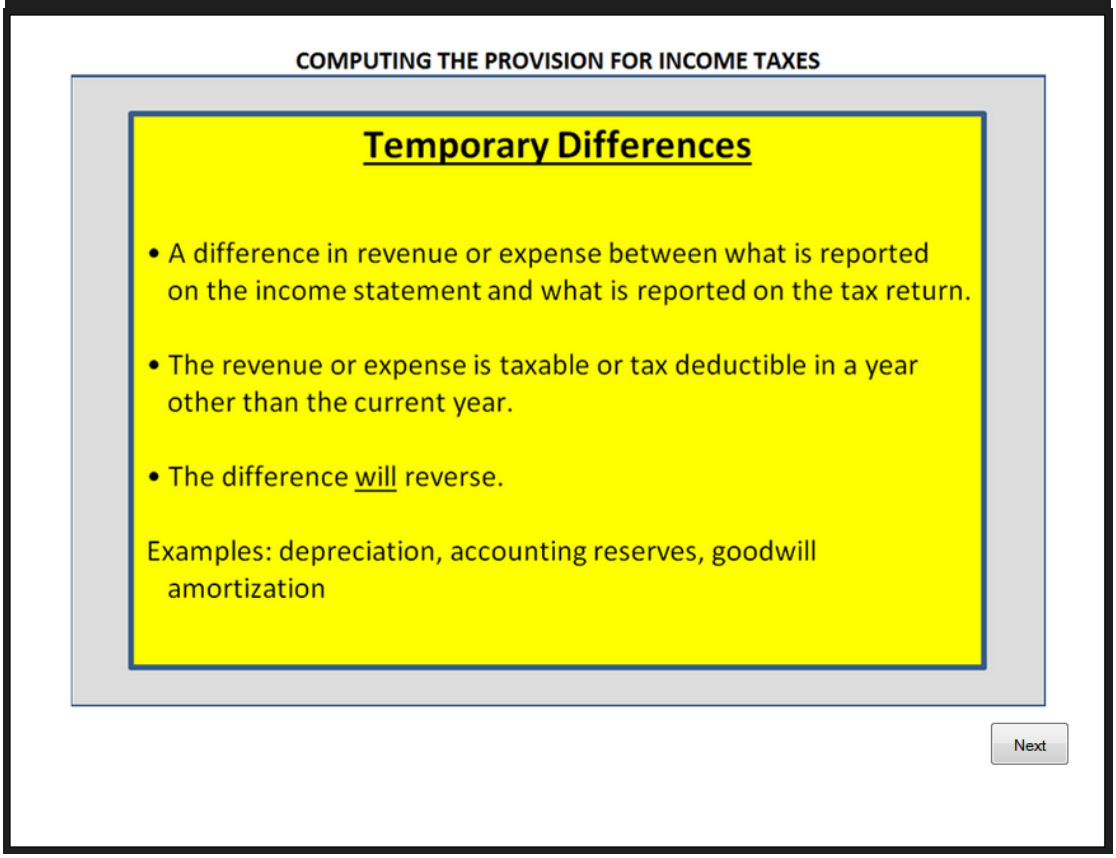
COMPUTING THE PROVISION FOR INCOME TAXES
Temporary Differences
• A difference in revenue or expense between what is reported on the income statement and what is reported on the tax return.
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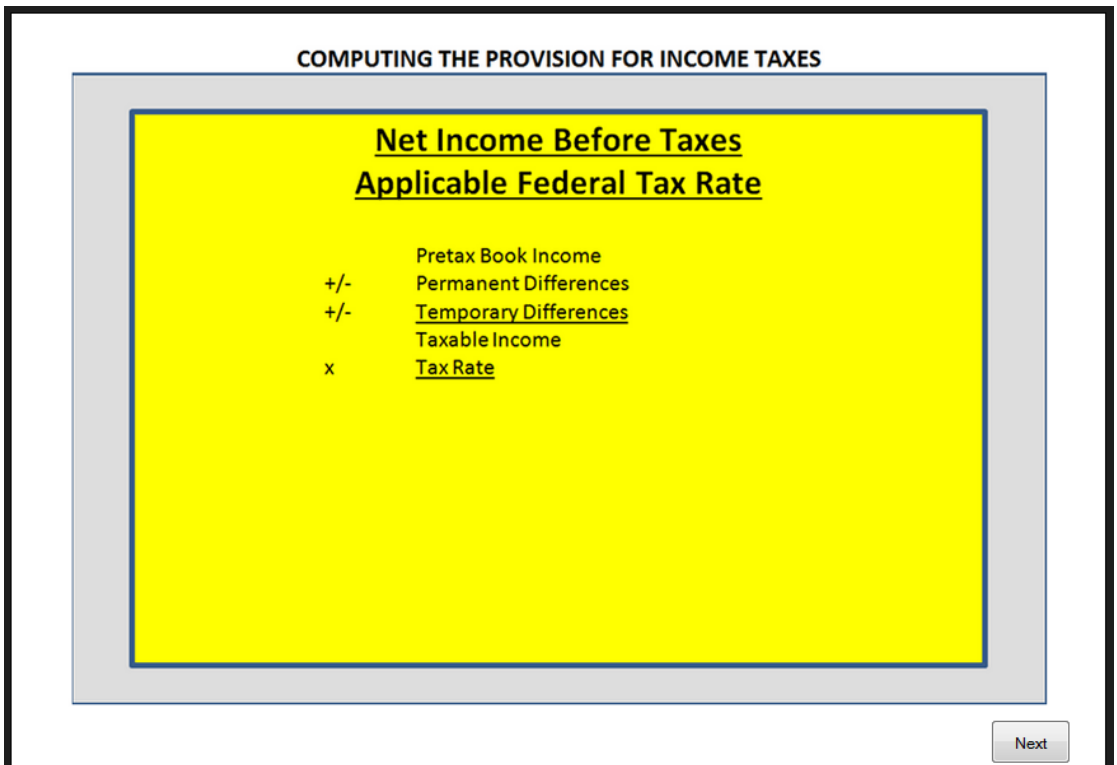
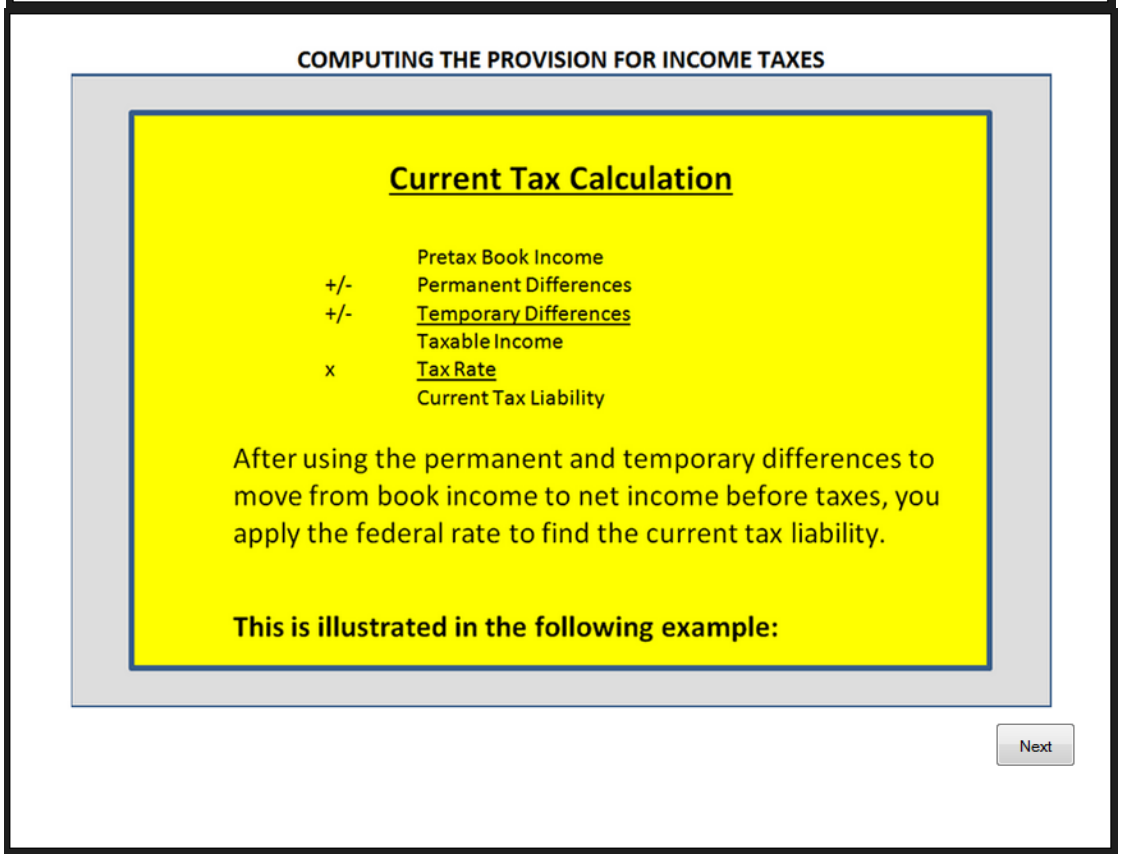
Examples: depreciation, accounting reserves, goodwill amortization
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Net Income Before Taxes
Applicable Federal Tax Rate
Pretax Book Income
+/- Permanent Differences
+/- Temporary Differences
Taxable Income
x Tax Rate
Next


COMPUTING THE PROVISION FOR INCOME TAXES
Current Tax Calculation
Pretax Book Income
+/- Permanent Differences
+/- Temporary Differences
Taxable Income
x Tax Rate
Current Tax Liability
After using the permanent and temporary differences to move from book income to net income before taxes, you apply the federal rate to find the current tax liability.
This is illustrated in the following example:
Next

COMPUTING THE PROVISION FOR INCOME TAXES

This continues the example started in the deferred tax calulation

Current Tax Calculation

	Income/(deduction)
Pre-tax book income	$ 9
Book-Tax Adjustments	
Permanent Items	
Tax exempt income	$ (55)
Nondeductible meals & ent.	$ 15
Temporary Items	
Real Estate	$ 25
Furniture & Fixture	$ (15)
Accrued Bonus	$ 50
Other accrued expenses	$ 60
Taxable Income	$ 89
ATR (Blend of federal and state rates)	37.60%
Current Tax Expense	**$ 33**

Next

COMPUTING THE PROVISION FOR INCOME TAXES

Current Tax Liability

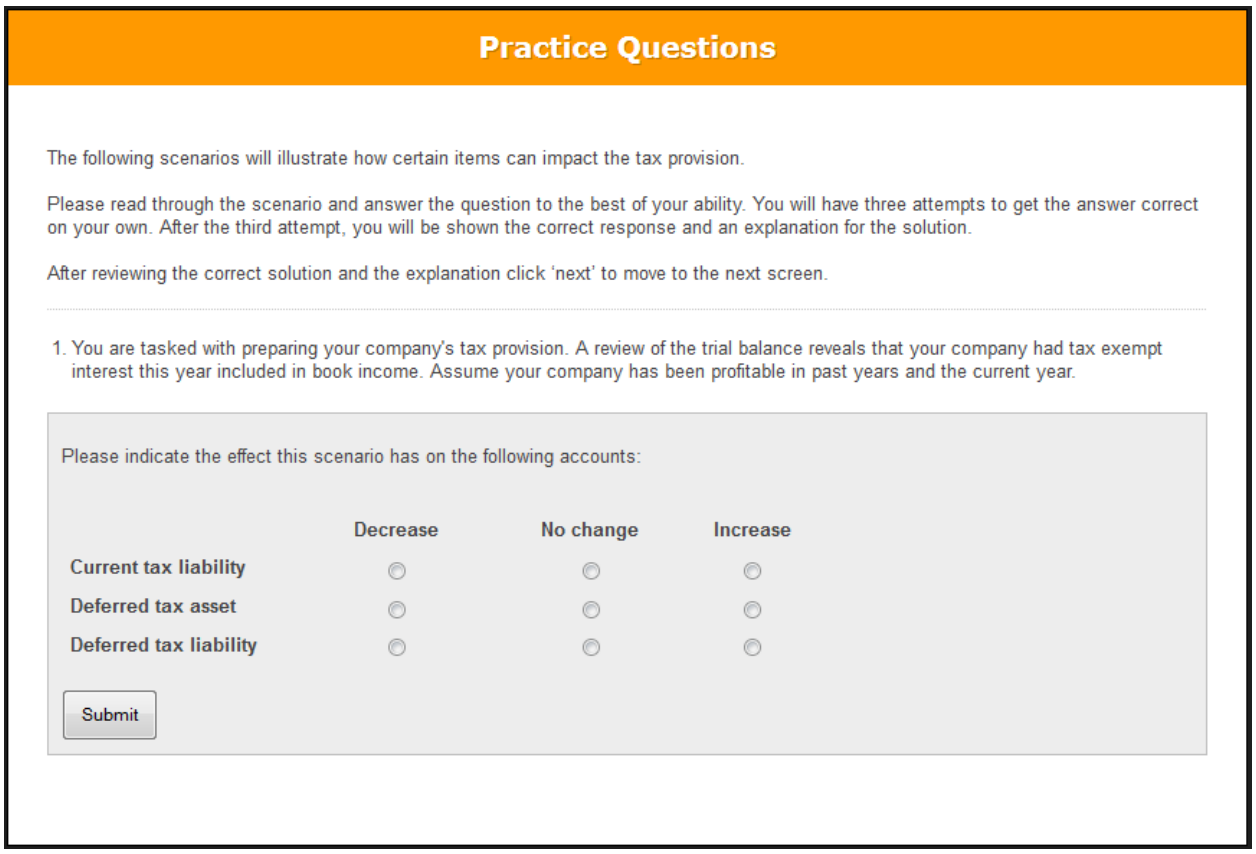
In this example there was an overall current tax liability.

This concludes the current tax calculation.

Now you'll have the opportunity to work through three independent scenarios and determine the impact each scenario would have on the overall tax provision.

Next

Active Condition Practice Screenshots



Practice Questions

The following scenarios will illustrate how certain items can impact the tax provision.

Please read through the scenario and answer the question to the best of your ability. You will have three attempts to get the answer correct on your own. After the third attempt, you will be shown the correct response and an explanation for the solution.

After reviewing the correct solution and the explanation click 'next' to move to the next screen.

2. You are tasked with preparing your company's tax provision. A review of the trial balance shows that there was a balance in accrued bonuses at the end of the year (beginning of year balance in this account was $0). None of these bonuses were paid within 2.5 months of year end. Assume your company has been profitable in past years and the current year.

Please indicate the effect this scenario has on the following accounts:

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit

Practice Questions

The following scenarios will illustrate how certain items can impact the tax provision.

Please read through the scenario and answer the question to the best of your ability. You will have three attempts to get the answer correct on your own. After the third attempt, you will be shown the correct response and an explanation for the solution.

After reviewing the correct solution and the explanation click 'next' to move to the next screen.

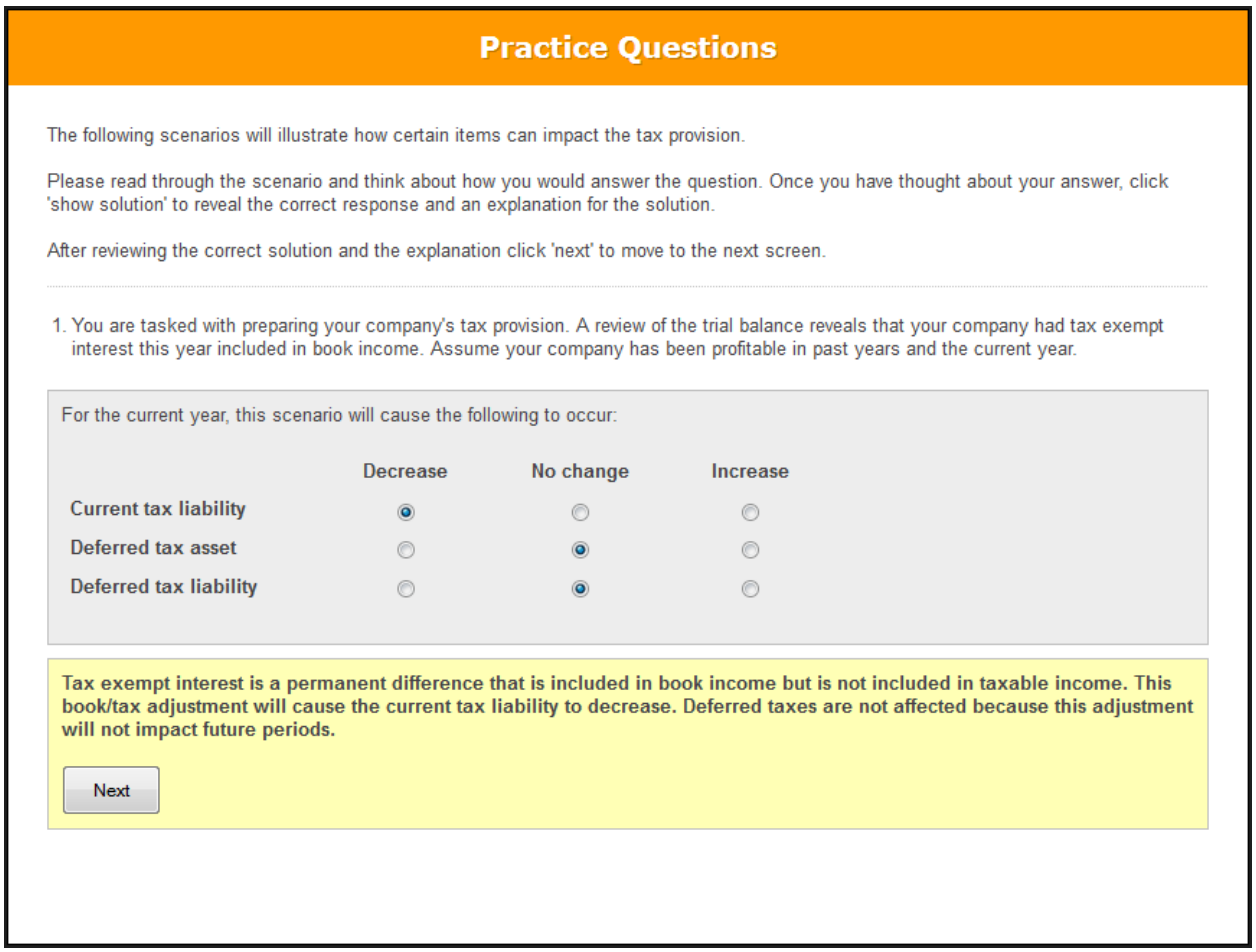
3. You are tasked with preparing your company's tax provision. A review of the trial balance reveals that in the current year your company placed in service an intangible asset with a book life of 20 years and a tax life of 15 years. Assume your company has been profitable in past years and the current year.

Please indicate the effect this scenario has on the following accounts:

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit

Passive Condition Practice Screenshots



Practice Questions

The following scenarios will illustrate how certain items can impact the tax provision.

Please read through the scenario and think about how you would answer the question. Once you have thought about your answer, click 'show solution' to reveal the correct response and an explanation for the solution.

After reviewing the correct solution and the explanation click 'next' to move to the next screen.

2. You are tasked with preparing your company's tax provision. A review of the trial balance shows that there was a balance in accrued bonuses at the end of the year (beginning of year balance in this account was $0). None of these bonuses were paid within 2.5 months of year end. Assume your company has been profitable in past years and the current year.

For the current year, this scenario will cause the following to occur:

	Decrease	No change	Increase
Current tax liability	○	○	◉
Deferred tax asset	○	○	◉
Deferred tax liability	○	◉	○

Accrued bonus is a temporary difference. Accrued bonus expense is allowed for book but is only allowed for tax if bonuses are paid within 2.5 months of year end. Because bonuses are not allowed this year, current income tax expense will increase, but this difference will decrease subsequent period's income tax expense, and a deferred tax asset is created.

Next

Practice Questions

The following scenarios will illustrate how certain items can impact the tax provision.

Please read through the scenario and think about how you would answer the question. Once you have thought about your answer, click 'show solution' to reveal the correct response and an explanation for the solution.

After reviewing the correct solution and the explanation click 'next' to move to the next screen.

3. You are tasked with preparing your company's tax provision. A review of the trial balance reveals that in the current year your company placed in service an intangible asset with a book life of 20 years and a tax life of 15 years. Assume your company has been profitable in past years and the current year.

For the current year, this scenario will cause the following to occur:

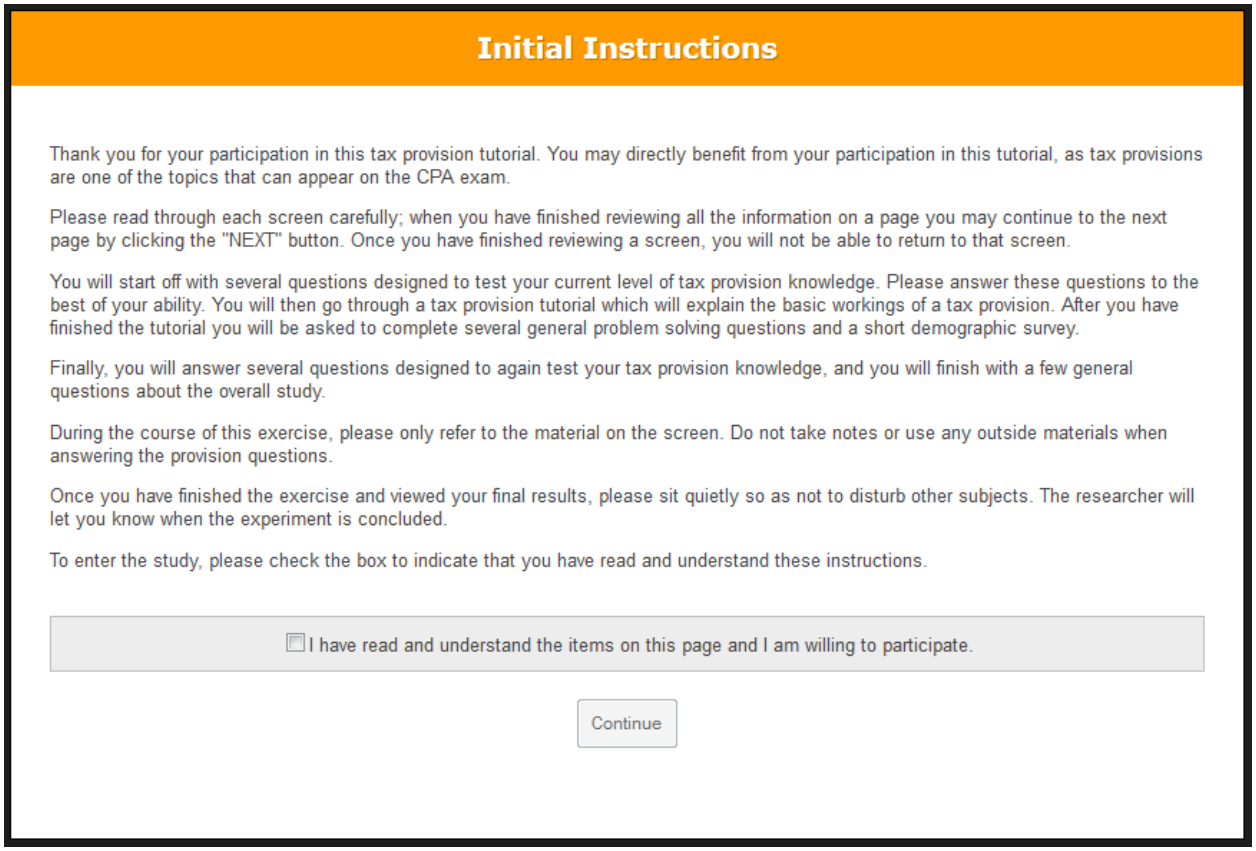
	Decrease	No change	Increase
Current tax liability	◉	○	○
Deferred tax asset	○	◉	○
Deferred tax liability	○	○	◉

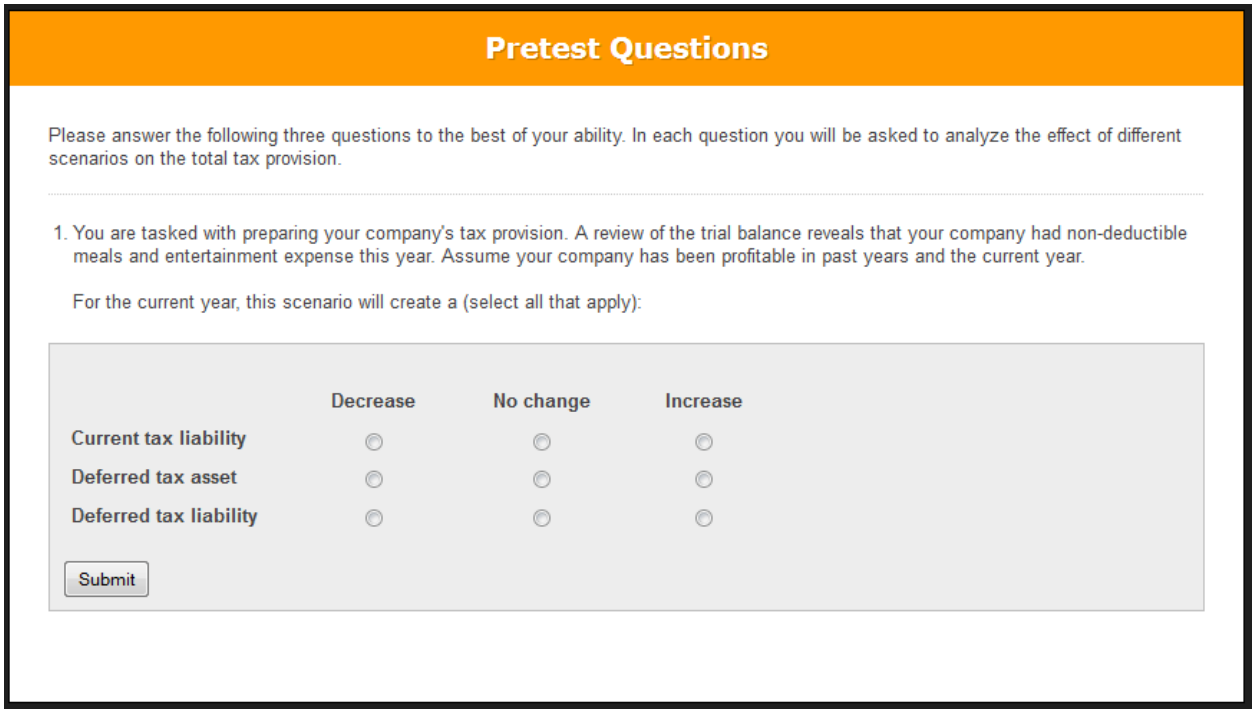
Amortization can result in a temporary book/tax difference. In this scenario, book life is longer than tax life, so book income will recognize less amortization expense in years 1-15 than tax income. After year 15 tax income will no longer have amortization, but book income amortization will continue for 5 more years. Because this difference will increase subsequent periods' income tax expense (here, years 16 -20), a deferred tax liability is created.

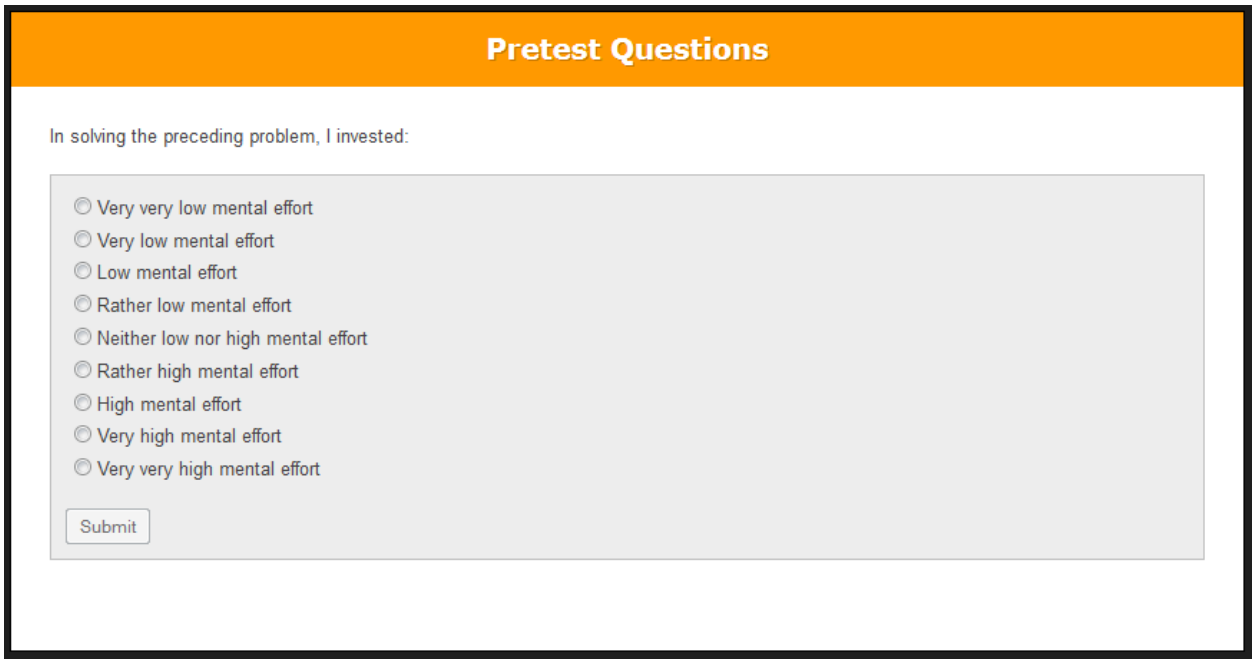
Next

Appendix B: Selected Additional Screenshots of Experimental Instrument

The following screen shots were seen by all experimental participants.






Pretest Questions
In solving the preceding problem, I invested:
Very very low mental effort
Very low mental effort
Low mental effort
Rather low mental effort
Neither low nor high mental effort
Rather high mental effort
High mental effort
Very high mental effort
Very very high mental effort
Submit


Pretest Questions
How sure are you of your answer?
Very confident
Confident
Have some confidence
Not at all confident
Submit

Pretest Questions

2. You are tasked with preparing your company's tax provision. A review of the trial balance shows that the allowance for doubtful accounts increased this year. Assume your company has been profitable in past years and the current year.

For the current year, this scenario will create a (select all that apply):

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit

Pretest Questions

In solving the preceding problem, I invested:

- ○ Very very low mental effort
- ○ Very low mental effort
- ○ Low mental effort
- ○ Rather low mental effort
- ○ Neither low nor high mental effort
- ○ Rather high mental effort
- ○ High mental effort
- ○ Very high mental effort
- ○ Very very high mental effort

Submit

Pretest Questions

How sure are you of your answer?

- ○ Very confident
- ○ Confident
- ○ Have some confidence
- ◉ Not at all confident

Submit

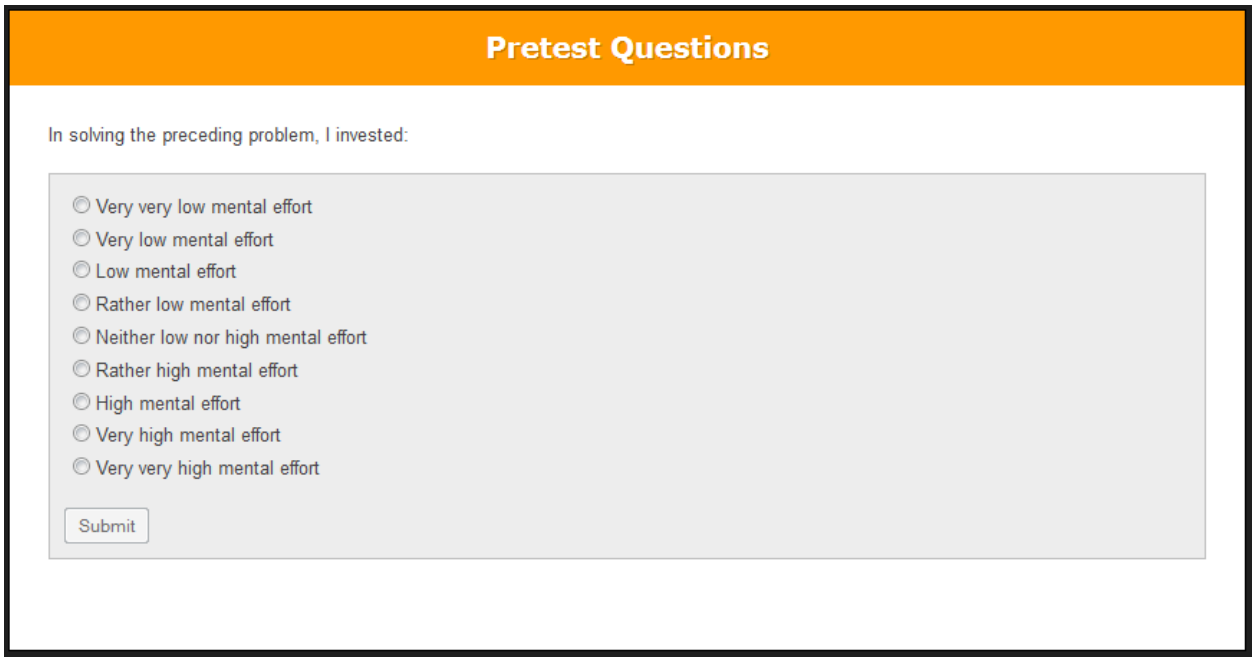
Pretest Questions

3. You are tasked with preparing your company's tax provision. A review of the company assets shows that a new piece of equipment with a five-year useful life was purchased and placed in service this year. Assume that your company will take advantage of bonus depreciation on the asset this year. Assume your company has been profitable in past years and the current year.

   For the current year, this scenario will create a (select all that apply):

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit


Pretest Questions
In solving the preceding problem, I invested:
Very very low mental effort
Very low mental effort
Low mental effort
Rather low mental effort
Neither low nor high mental effort
Rather high mental effort
High mental effort
Very high mental effort
Very very high mental effort
Submit


Pretest Questions
How sure are you of your answer?
Very confident
Confident
Have some confidence
Not at all confident
Submit

Introduction - Accounting for Income Taxes

The Financial Accounting Standards Board (FASB) states that financial statements should reflect both the current and deferred tax consequences of the events recognized either in financial statements or on tax returns.

The FASB codified this concept in ASC 740 - Income Taxes. In general, the purpose of ASC 740 is to establish financial accounting standards for the effects of income taxes due to an enterprise's activities in both current and prior years. More specifically, an enterprise must recognize:

- The amount of taxes payable (refundable) in the current year
- Deferred tax liabilities (assets) for future tax consequences of events that have been recognized in an enterprise's financial statements or tax return

Thus, the main components of a tax provision consist of:

- **Current tax provision**
  Estimate of taxes payable or refundable on tax returns for the current year
- **Deferred tax provision**
  Change in the estimated future tax effects attributable to temporary differences and carry forwards

Next

GAAP Basis vs Tax Basis

The goals are different under financial reporting (GAAP) than they are under the tax code, which leads to book/tax differences.

GAAP

- Part of FASB's conceptual framework
- Serves as the basis for resolving accounting and reporting issues

TAX

- Influenced by the current political and economic environment
- Serves as the basis for which the government collects taxes

Due to these differences, an accounting event has the potential to impact the current income tax liability, the deferred tax asset and/or the deferred tax liability. The following tutorial will walk you through the basic computation of a tax provision.

Next

Supplemental Questions

You have successfully completed the tax provision tutorial! Before moving on to the final provision questions, please complete the following demographic questions and the general problem solving questions.

Demographic Questions

In order to help us understand why your responses might differ from others, please answer the following questions:

1. Age	
2. Gender	○ Male ○ Female
3. GPA (enter your best estimate if unsure)	
4. Number of accounting internships	
5. Years working in accounting (number with one decimal)	
6. Have you ever worked on corporate taxes?	○ Yes ○ No
• If so, for how many years?	
7. Have you ever worked on a tax provision?	○ Yes ○ No
8. Had any previous tax provision training?	○ Yes ○ No

Submit

Supplemental Questions

You have successfully completed the tax provision tutorial! Before moving on to the final provision questions, please complete the following demographic questions and the general problem solving questions.

General Problem Solving Questions

Please answer the following questions to the best of your ability.

1. Five persons are sitting in a line. One of the two persons, at the farthest ends, is smart, the other one is fair.

   A shy person is sitting to the right of a feeble person. A tall person is to the left of the fair person and the feeble person is sitting between the smart and shy persons.

   Tall person is at which place counting from right?

- ◯ First
- ◯ Second
- ◯ Third
- ◯ Fourth
- ◯ Cannot be determined

2. Clorida is taller than Ivory. Emily is taller than Lovely. Lovely is taller than Enamol. To determine who among them is the tallest, which of the following further information, if any, is required?

- ◯ Clorida is taller than Enamol and Lovely
- ◯ No further information is needed
- ◯ Emily is taller than Ivory
- ◯ Clorida is taller than Lovely
- ◯ Enamol is taller than Clorida

3. In the following question, five groups of letters have been given, out of which four are alike in some way and one is different. Choose the odd one out.

- ◯ Treat
- ◯ Great
- ◯ Tears
- ◯ Rates
- ◯ Heard

Submit Continue

Test Questions

Please answer the following three questions to the best of your ability. In each question you will be asked to analyze the effect of different scenarios on the total tax provision.

1. You are tasked with preparing your company's tax provision. A review of the trial balance reveals that your company had non-deductible meals and entertainment expense this year. Assume your company has been profitable in past years and the current year.

   For the current year, this scenario will create a (select all that apply):

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit

Test Questions

In solving the preceding problem, I invested:

- ○ Very very low mental effort
- ○ Very low mental effort
- ○ Low mental effort
- ○ Rather low mental effort
- ○ Neither low nor high mental effort
- ○ Rather high mental effort
- ○ High mental effort
- ○ Very high mental effort
- ○ Very very high mental effort

Submit

Test Questions

How sure are you of your answer?

- ○ Very confident
- ○ Confident
- ○ Have some confidence
- ○ Not at all confident

Submit

Test Questions

2. You are tasked with preparing your company's tax provision. A review of the trial balance shows that the allowance for doubtful accounts increased this year. Assume your company has been profitable in past years and the current year.

   For the current year, this scenario will create a (select all that apply):

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit

Test Questions

In solving the preceding problem, I invested:

- ◯ Very very low mental effort
- ◯ Very low mental effort
- ◯ Low mental effort
- ◯ Rather low mental effort
- ◯ Neither low nor high mental effort
- ◯ Rather high mental effort
- ◯ High mental effort
- ◯ Very high mental effort
- ◯ Very very high mental effort

Submit

Test Questions

How sure are you of your answer?

- ◯ Very confident
- ◯ Confident
- ◯ Have some confidence
- ◯ Not at all confident

Submit

Test Questions

3. You are tasked with preparing your company's tax provision. A review of the company assets shows that a new piece of equipment with a five-year useful life was purchased and placed in service this year. Assume that your company will take advantage of bonus depreciation on the asset this year. Assume your company has been profitable in past years and the current year.

   For the current year, this scenario will create a (select all that apply):

	Decrease	No change	Increase
Current tax liability	○	○	○
Deferred tax asset	○	○	○
Deferred tax liability	○	○	○

Submit

Test Questions

In solving the preceding problem, I invested:

- ○ Very very low mental effort
- ○ Very low mental effort
- ○ Low mental effort
- ○ Rather low mental effort
- ○ Neither low nor high mental effort
- ○ Rather high mental effort
- ○ High mental effort
- ○ Very high mental effort
- ○ Very very high mental effort

Submit

Test Questions

How sure are you of your answer?

- ◯ Very confident
- ◯ Confident
- ◯ Have some confidence
- ◯ Not at all confident

Submit

Test Questions

4. You are tasked with preparing your company's tax provision. A review of the company assets shows that a piece of equipment with a five-year useful life was purchased and placed in service 3 years ago. Assume that your company took advantage of bonus depreciation when the asset was placed in service, and that your company still owns the asset at the end of this year. Assume your company has been profitable in past years and the current year.

   For the current year, this scenario will create a (select all that apply):

	Decrease	No change	Increase
Current tax liability	◯	◯	◯
Deferred tax asset	◯	◯	◯
Deferred tax liability	◯	◯	◯

Submit

Test Questions

In solving the preceding problem, I invested:

- ○ Very very low mental effort
- ○ Very low mental effort
- ○ Low mental effort
- ○ Rather low mental effort
- ○ Neither low nor high mental effort
- ○ Rather high mental effort
- ○ High mental effort
- ○ Very high mental effort
- ○ Very very high mental effort

Submit

Test Questions

How sure are you of your answer?

- ○ Very confident
- ○ Confident
- ○ Have some confidence
- ○ Not at all confident

Submit

Post-Test Feedback

Below are the results of your participation in this tutorial. Once you have finished looking over your results, please click "next" to finish the study.

Scenario	Pre-Tutorial Attempt	Post-Tutorial Attempt	Correct Answer	Feedback
Meals & Entertainment	CTL: Decrease DTA: Decrease DTL: Decrease	CTL: Decrease DTA: No Change DTL: Increase	CTL: Increase DTA: No Change DTL: No Change	Permanent Difference - Less expense allowed for tax
Allowance for Doubtful Accounts	CTL: Decrease DTA: Decrease DTL: Decrease	CTL: No Change DTA: No Change DTL: No Change	CTL: Increase DTA: Increase DTL: No Change	Temporary difference - tax benefit in the future
Depreciation (Year 1)	CTL: Decrease DTA: Decrease DTL: Decrease	CTL: Increase DTA: No Change DTL: Decrease	CTL: Decrease DTA: No Change DTL: Increase	Temporary difference - tax expense in the future
Depreciation (Year 3)	N/A	CTL: No Change DTA: Decrease DTL: Decrease	CTL: Increase DTA: No Change DTL: Decrease	Temporary difference - tax expense has started reversing, so deferred liability is decreasing

Next

Post-Experimental Questions

Please answer the following questions regarding the experiment you have just completed.

1. Overall, in completing this experiment, would you say you invested:

- ○ Very very low mental effort
- ○ Very low mental effort
- ○ Low mental effort
- ○ Rather low mental effort
- ○ Neither low nor high mental effort
- ○ Rather high mental effort
- ○ High mental effort
- ○ Very high mental effort
- ○ Very very high mental effort

2. How would you rate your level of enjoyment in completing this experiment:

- ○ Very very low enjoyment
- ○ Very low enjoyment
- ○ Low enjoyment
- ○ Rather low enjoyment
- ○ Neither low nor high enjoyment
- ○ Rather high enjoyment
- ○ High enjoyment
- ○ Very high enjoyment
- ○ Very very high enjoyment

3. How would you rate this experiment's overall level of difficulty:

- ○ Very very low difficulty
- ○ Very low difficulty
- ○ Low difficulty
- ○ Rather low difficulty
- ○ Neither low nor high difficulty
- ○ Rather high difficulty
- ○ High difficulty
- ○ Very high difficulty
- ○ Very very high difficulty

Submit

Post-Experimental Questions

Please answer the following questions regarding the experiment you have just completed.

4. During the training phase of this study, the explanation of how to compute the tax provision was presented to you in:

- ○ A flowchart format
- ○ A bulleted list format

5. During the practice phase of this study (that immediately followed the training phase), the three examples you were given required that you:

- ○ Attempt the solution up to three times for each of the scenarios
- ○ View the correct solution after thinking about each of the scenarios

Submit

Finished

Thank you for your participation in this study! Please sit quietly until the researcher lets you know the study is complete.

Feel free to use this computer to surf the web, but please **DO NOT** get out your text books/cell phones as that will disturb participants still completing the study.

Please let the researcher know if you have any questions and thank you for your time!